Annual Drilling Number

the OIL AND GAS JOURNAL

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HOW TO GET YOUR MONEY'S WORTH FROM DRILL COLLARS

p.121

NEWS

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What will tomorrow's marketing pattern be? p. 104

Where Russia plans Mohole-type wells p. 116

TECHNOLOGY

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Drilling contractors still folding up p. 187

Active drilling areas

Here's a guide to the active drilling areas in North America. Costs and other factors represent average conditions for the respective areas. p. 148

Lane-Wells has the *RIGHT* logging package for your well

Developing the maximum information from a logging program depends on having the right log at the right time for the specific conditions of your well. In Lane-Wells' wide variety of reliable logging services you will find the right tool or combination of tools for every hole condition.

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OIL AND GAS JOURNAL
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Annual drilling number

HOW TO GET MORE FROM DRILL COLLARS 121

By H. M. Rollins

A comprehensive report on drill-collar selection, operation, and care. Reasons for drill-collar failures are covered in detail, followed by suggested ways to avoid these failures through (1) better design; (2) better machine-shop practice; (3) better rig practice; and (4) systematic inspection and maintenance.

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Tips on selecting joints 128

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Uinta basin drillers cut well costs 142

By Ed McGhee

Random occurrence of water in formations drilled in this area means trouble in predicting drilling conditions. But contractors are drilling wells, including wildcats, on a footage basis and continually reducing costs.

Where drilling is most active 148

By Peter B. Bike

Is Sleepy Hollow still awake? What's going on in Patrick Draw, Wyoming? These and other questions are answered in this latest report on active drilling areas in North America. And a survey of nearly 200 operating firms and individuals was made to get the cost figures included in this exclusive Journal report.

Drilling contractors still selling out 187

By Robert B. Bizal

But a new Journal study shows that the dropout rate is slowing down. The giant contractors continue to take on more rigs. They now own more than 18% of the U. S. total.

Technology

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By W. L. Nelson

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New crude unit is designed for computer control—Jet cleaning halves down time of waste-water filter drums—New fuel does better job in flame cutting.

Faster, more accurate R.v.p. measurements 196

By T. J. Puzniak and James Eppolito

The microvapor-pressure method is a new way to correlatively measure vapor pressure rapidly and accurately. Apparatus is simple to operate, of rugged construction, and requires only 2 minutes to clean in preparation for the next test.

Nonlubricated compressors prove their worth 202

By P. J. Chandler

Five years' experience with "moly"-impregnated rings and packing indicates that lubricating oil may not always be the most satisfactory antifriction agent.

Monthly cost indexes 205

By W. L. Nelson

Pipelining notes 207

New concepts likely to make present gas-measurement methods obsolete. Stands facilitate pipe reconditioning.

THE OIL AND GAS JOURNAL **Newsletter**

October 2, 1961

Significant this week

Oil-well drilling may be next battleground in the market warfare between aluminum and steel.

Until recently, aluminum drill pipe wasn't considered a real threat. But that view is changing. Among the reasons: Ultrasonic-inspection okay awarded to an aluminum string after 100,000 ft. of drilling.

Drillers have plenty of interest in battle between steel and aluminum. Successful light-weight drill pipe would mean smaller rigs—and lower operating costs (p. 97).

For the moment, there's no prospect of a general increase in drilling-crew wages.

And the time-honored 56-hour week seems likely to stay around for awhile. Recent attempts to cut the work week seem to have fizzled for lack of support, although reductions have been made in some areas.

Talk of higher pay and shorter hours still circulates, however (p. 112).

In this Annual Drilling Issue, you'll also find:

—A penetrating look at drill-collar problems and what can be done to overcome them.

—A report on how drillers in Utah's remote Uinta basin are trimming well costs in spite of random-water troubles.

—An authoritative Journal guide to active drilling areas in North America.

—A review of happenings in the drilling-contractor field which shows that contractors aren't going out of business so fast this year.

Special drilling section begins on p. 121.

New burner attachment knocks down cost of home heating.

Humble has disclosed results of extensive testing of the device which was developed by company's affiliate, Esso Research & Engineering. Says Humble: Heating-oil bills were cut more than 20%.

Conventional burners waste some of their fuel through imperfect combustion. Esso Research device, which can be added to existing burner, insures full combustion (p. 101).

Texas Railroad Commission's historic order dealing with rules for pipeline-well hookups may get its first test soon.

Abilene independent wants commission to invoke 1958 order,

and force Crown Central Pipe Line & Transportation to connect his tank batteries in North Texas' Haskell County Regular field. Case is stirring up keen interest (p. 114).

FPC's newest member, Charles R. Ross, thinks government regulation in some areas of business can be helpful.

However, the Vermont Republican isn't keen on the concept of federal controls (p. 102).

Signs indicate oil industry can expect long-drawn-out attack by organized labor.

Reports say current scattered activity is part of master plan for organizing every branch of oil (p. 110).

Honolulu Oil stockholders are willing to take chances.

They've proved this by telling management to go ahead with $361-million sale of the company to Tidewater and Pan American although hurdles have been placed in the way. IRS hasn't cleared the deal, and the Justice Department is trying to block it through an antitrust suit (p. 107).

Canada's 1961 crude exports to U. S. will be highest ever.

Last-half surge will raise volume 54%. This will mean full-year average of 178,500 bbl. daily (p. 100).

Elsewhere around the world:

Russians are laying plans for their own Mohole program.

Aim: To drill five super-deep tests that would range from about 33,000 to 49,000 ft.

Two of these holes would be of great interest to oil geologists everywhere. They're planned in oil-producing regions of Caspian Sea (p. 116).

French will keep Edjele crude flowing despite shut down of regular pipeline outlet.

Bizerte squabble has put main 24-in. line to Mediterranean out of action. So CREPS is building 29-mile branch line to divert flow into new Ohanet-Hassi Messaoud system (p. 118).

News in the making

Watch for these rig developments:

Before year's end, there'll be a gas turbine driving a drilling rig in the field. Advent of turbine has been delayed by high fuel consumption. But this will be offset by using two machines, shutting one down when load can be carried by the other.

Rig manufacturers are pushing plans for electric-wheel draw works, may have one ready by mid-1962. One or two motors will be mounted on draw-works drum shaft. Advantages: Light-

ness, portability, elimination of chains and gears.

Things are humming in California's San Joaquin Valley.

Standard of California reportedly plans 460-well drilling program there. These wells in such fields as Buena Vista, Cymric, and Lost Hills would be shallow producers aimed at increasing company's low-gravity crude output.

Production men are keeping an eye on Poso Creek field in the same area. Field may become automated from wellhead to storage tanks next year. Socal is programing computer-control system that's expected to regulate flow from field's 150-plus wells and to move the oil into storage.

Look for some lawsuits to be filed by Texas pipelines to test validity of the state's new dedicated-reserve gas tax.
Industry is confident that the tax, like its two predecessors, is unconstitutional.

Aerial trams—known as cable ways—are helping to string pipe for ENI's Central European system.
Trams are like those Swiss army uses to move supplies in mountainous areas. Thirty miles of pipe already have been strung near Genoa, Italy for ENI's big-inch line via Switzerland to Germany.

Prospects look good for development of a detector that could find even small leaks when run through pipelines.
So far, there's no likelihood of a practical device for going through a line to find where corrosion is occurring.

Eight per cent jump in earnings of domestic integrated oil companies is expected this year.
Standard & Poor's forecast calls for the boost despite sickly gasoline prices which may keep second-half earnings near 1960 level.
International earnings are expected to be up in second half, but not as much as in first 6 months.

Bureau of Mines may turn some of its researchers loose on oil-finding problems.
Historically, production has been bureau's chief concern. But now some of the agency's people are checking closely on work in oil laboratories to get angles on possible exploration projects.

Expect a call, probably this week, for nominations for Louisiana and Texas federal offshore areas. If enough interest is shown, Bureau of Land Management will slate lease sale.
Area for Texas nominations excludes two large target ranges being sought by Air Force and Navy. Louisiana nominations will be in Zones 3 and 4.

Market memo

Oct. 2, 1961

Don't laugh too loudly at Fina's pink air advertising. The newcomer may be proving it pays to be different, even in touting gasoline.

Petrofina's Marketing Veep Jack Shea says his company approved the whimsical, sophisticated campaign because of deep dissatisfaction with oil-industry advertising. Results of the pink-air approach, he says, have been remarkable.

What Fina didn't like about conventional gasoline copy: Its claims of fantastic service or fantastic additives are unbelievable . . . The customer really has a simple understanding of gasoline—if it doesn't knock, it's good . . . He trusts the integrity of oil products generally . . . Oil themes have been too stereotyped and haven't drawn the customer's attention to the right things. The public too often notices such things as the monthly gasoline bills, carbon monoxide, flat tires, dead batteries—not how necessary and valuable gasoline is.

What Fina wanted: Something unusual to attract and hold reader interest . . . A lighthearted campaign kidding other gasoline advertising and even Fina . . . No pretense but realistic talk about Fina products, the company, its facilities and services . . . All this on a limited budget which dictated one medium only.

What Fina got: Series of full-page newspaper ads kidding about pink-air additive for tires, a pink-air pipeline, and pink tire-valve caps, mixed in with hard sell for the company and its products. More than 22,000 readers filled in coupons asking for 100,000 balloons; 1,000 wrote friendly letters of praise. Summer gasoline sales hit an all-time company peak. Jobbers and dealers for the first time became willing to tie in with their own ads and promotions. The ads made the splash Fina wanted.

Big changes are in the making for oil marketing. Several national marketers are now emerging. Historical price margins on gasoline are being eroded—the 1-cent spread between major and independent brands seems likely to stick. Among new marketing ideas: A super service center in an area surrounded by satellite gasoline-only stations. These are only a few of the trends that may emerge from today's chaotic conditions (see p. 104).

General inactivity marks the primary wholesale markets. Lack of buyers leaves posted prices untested **on the gulf** and along the river. Gulf low of 11 cents for 92-octane gasoline and 8.5 cents for No. 2 might yield to discounting in face of firm buying orders. In the **Mid-Continent,** 91-octane has reached the 10-cent level, and No. 2 spots are selling at 7.75 to 8 cents with most going at the low. Several majors are in a borrowing mood for gasoline on the coast. One reportedly has borrowed 200,000 bbl. for river delivery with repayment next year. A smaller marketer has borrowed 30,000 bbl. These deals are resulting from temporary shortages and dislocations caused by Hurricane Carla. Improvements were noted in such price-war areas as Indianapolis, Buffalo, St. Louis, and San Antonio.

Good Wells Make Good News

Recent Profitable Treatments Using Special Dowell Products and Services

October 2, 1961

While many oil and gas operators associate Dowell with stimulation and cementing services only, Dowell offers a wide variety of products and "auxiliary" services to help operators improve their wells. Here are four recent examples of Dowell products and "auxiliary" services in use:

- **Stonewall County, West Texas** (Old Oil Well) Scale buildup had shut off production from this well. Operator treated using 110 gallons Versene® 100 chelating agent mixed with 265 gallons fresh water. The solution was dumped down tubing with well dry, and rods were run in hole. Well was allowed to set for 24 hours, then Versene 100 was circulated with well pump for 48 hours. *Flush production after treatment was 60 bopd. After two weeks, production had leveled off at 17 to 22 bopd.*

- **Caddo County, Oklahoma** (Old Oil Well) This well was originally completed open hole. A gor of 2000 limited oil production to 90 bopd. Operator set liner and Dowell cut notch at 6020 feet using Abrasijet®. Well was then fractured by Dowell. *After treatment, well produced 200 bopd with a gor of only 150. Well was not producing at capacity. Operator attributes success of workover to single notch cut by Abrasijet.*

- **Kern County, California** (Old Oil Well) Production had declined due to a scale buildup in a 5½-inch, 80-mesh screen liner set from 3068 to 3131 feet. Plugging was nearly complete. Tubing weight could be set on top of scale buildup. Dowell cleaned by jetting 10,000 gallons three percent acid through a special jet gun with five downward-pointing nozzles. Injection rate was 4 bpm. Tubing was lowered at three feet per minute while jetting. *Production increased 86 percent after treatment.*

- **Wichita County, North Texas** (New Oil Well) This well was completed with open hole from 871 to 886 feet. It yielded only salt water despite the fact that apparent oil shows were encountered from 871 to 878 and from 881 to 886 feet. Further investigation revealed that upper sand was water and lower sand could not produce through mud block and head of water from upper zone. Dowell used Abrasijet at 883 feet and fractured. *After treatment, well produced 16 bopd allowable. Operator reports that economic loss was converted to profitable producer.*

Talk over your production problems with a Dowell representative. The chances are good that he has a service or product that can help you reduce your costs and increase your profits. Dowell services and products are offered in North and South America, Europe, North Africa and Iran. Dowell, Tulsa 14, Oklahoma.

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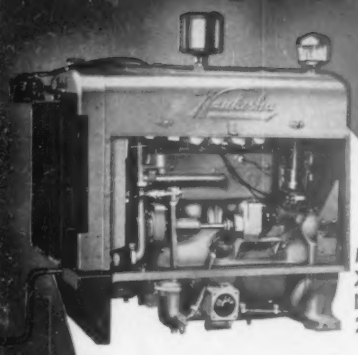
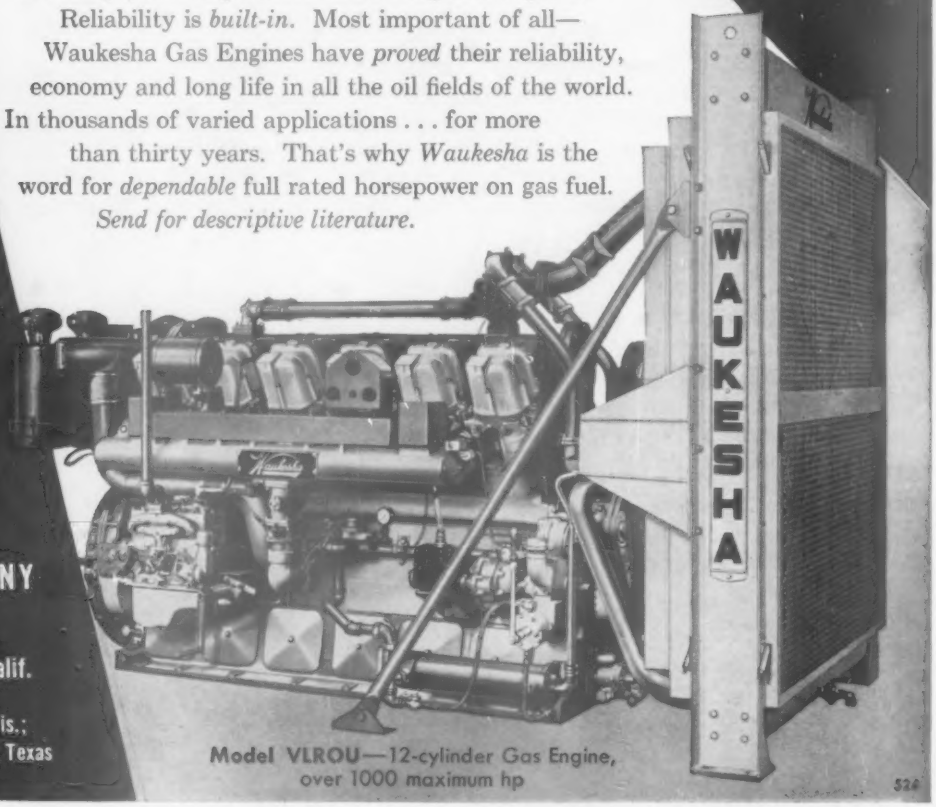


Model XAHU
Long Life Unit,
21 continuous hp

It's easy to pick a gas engine that's really "tailor made" to your needs. Get a Waukesha *designed-for-gas* engine! Then you can be sure—before you buy. The Waukesha gas engine line is *complete*. You can get exactly the right engine. The Waukesha combination of *designed-for-gas*—and built-for-gas construction features, and first quality materials—that means low fuel and lubrication costs—is the result of Waukesha's over fifty years' experience in building fine engines. Reliability is *built-in*. Most important of all—Waukesha Gas Engines have *proved* their reliability, economy and long life in all the oil fields of the world. In thousands of varied applications . . . for more than thirty years. That's why *Waukesha* is the word for *dependable* full rated horsepower on gas fuel. *Send for descriptive literature.*

10 to 1027 hp

61 to 5788 cu. in. displacement



Model VLROU—12-cylinder Gas Engine, over 1000 maximum hp

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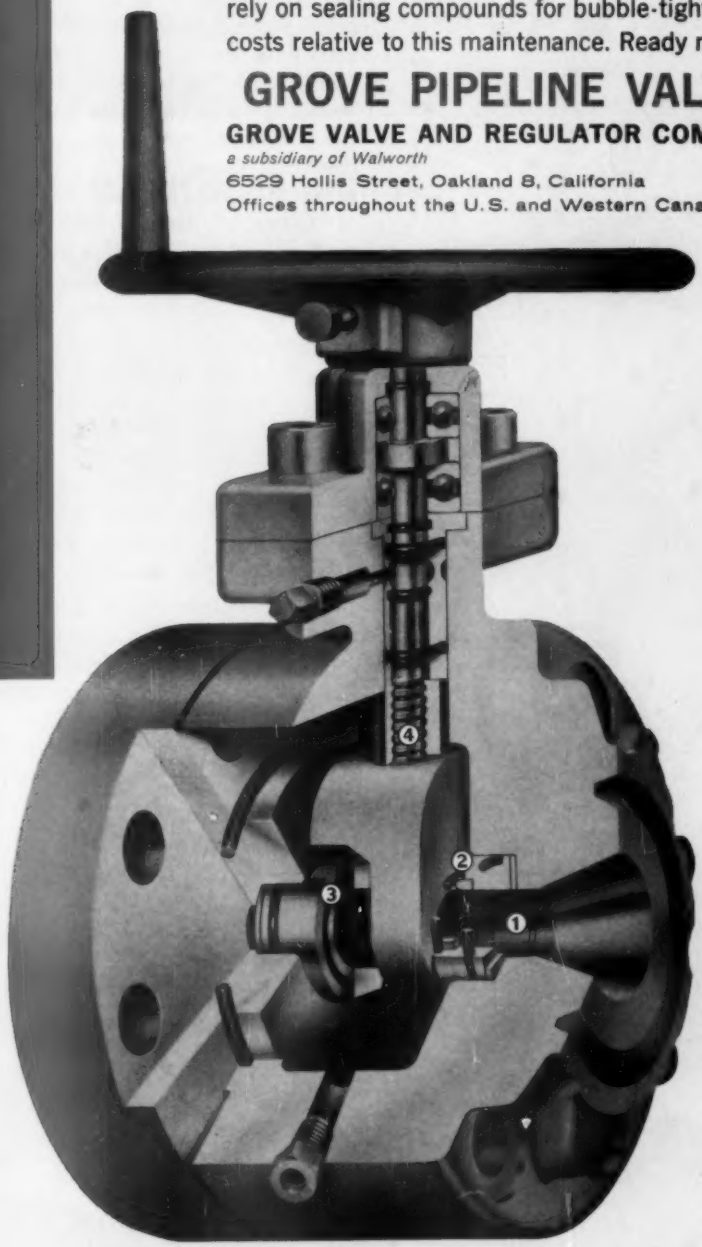
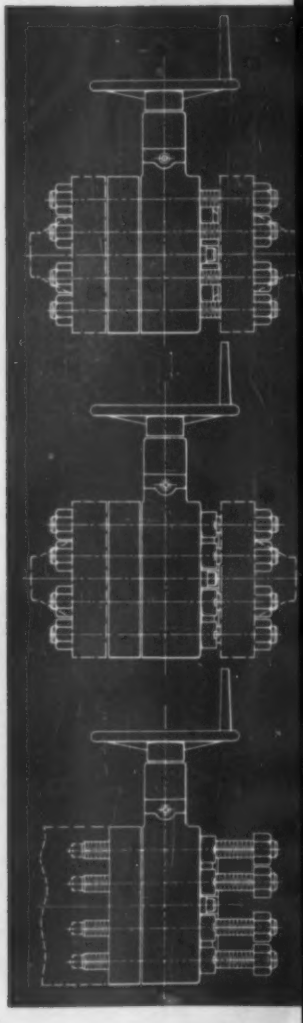


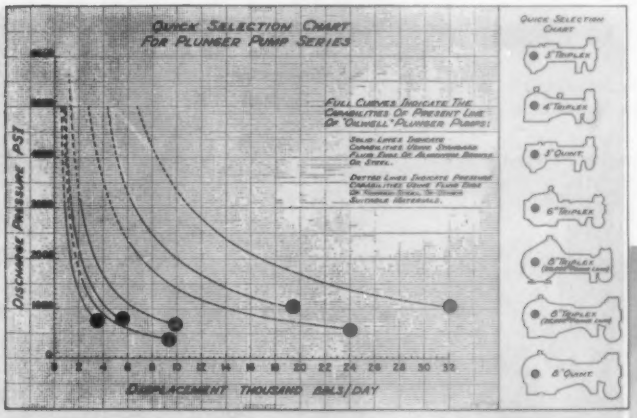


The "OILWELL" string...

PRODUCTS
SERVICES
STORES

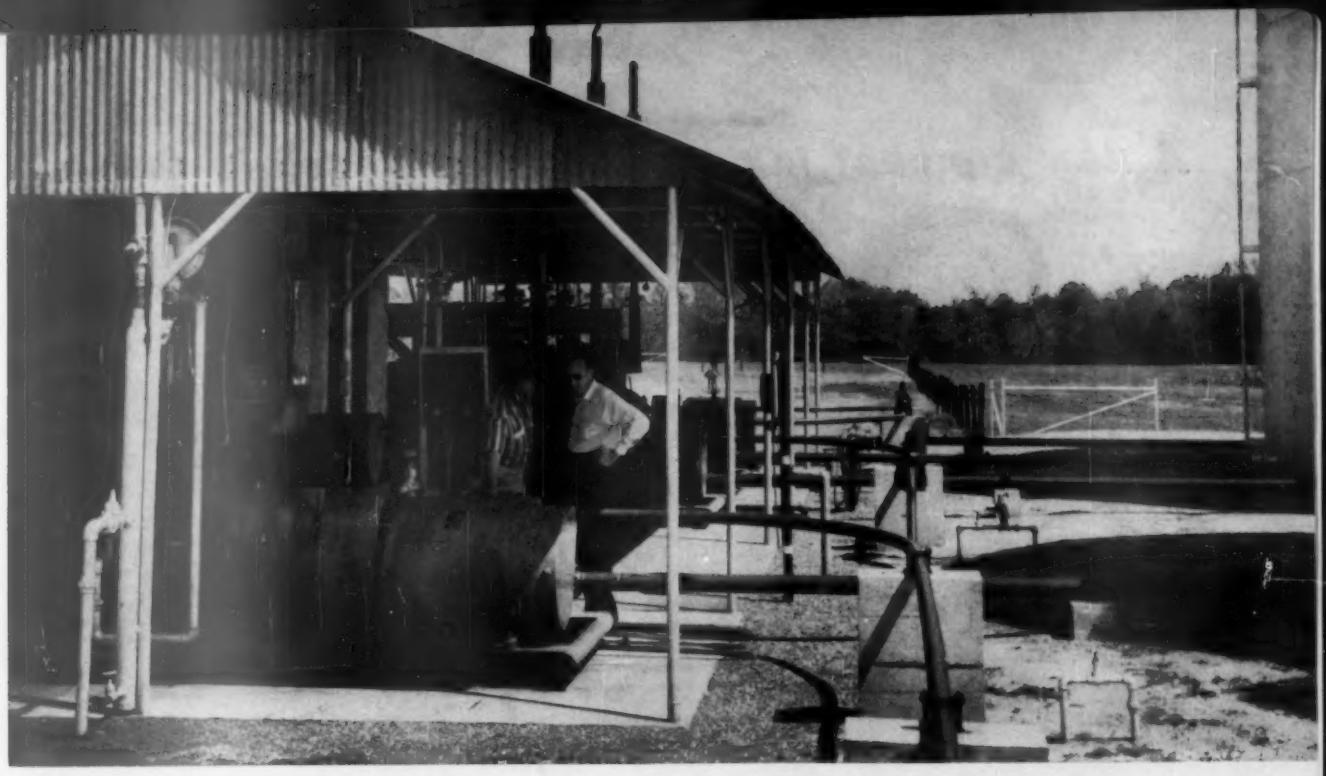
How to take the guesswork out of plunger pump selection

A mistake in horsepower, capacity, pressure requirements or suction and discharge piping arrangements can be costly. Here's a simple, nearly error-proof way of sizing the best plunger pump for your fluid-injection use—get your copy of "Oilwell's" new "Plunger Pump Selection Manual" without delay.



The manual describes in detail "Oilwell's" complete line of seven primary pumps. Volume-pressure range curves make it a simple matter to pick the pump that's right for the job. Picking plunger sizes is simple, too, because you'll find complete performance data for all plunger sizes available with each size pump. The selection manual also contains a wealth of other information including how to apply the pumps and how to size and arrange suction and discharge piping.

Write on your company letterhead for a free copy of "Oilwell's" Manual M29-1060. It's one of our ways of making sure that when you buy "Oilwell" equipment, you get a lot more than our product.



Why "Oilwell" waterflood pumps take it lying down

The pumps in the picture are operating in the New Odom field, and one of them has been pumping 24 hours a day for *eight months* without stopping. Naturally, it's an "Oilwell" pump and its design has a lot to do with its performance.

Every "Oilwell" plunger pump is designed horizontally for eight good reasons: *Low suction* . . . lowness of suction and discharge lines means maximum utilization of suction head and simplifies piping layout. *Less deadweight on crankshaft* . . . eases bearing loads, minimizes vibrational stress in frame and piping. *Simpler thrust transmission* . . . eliminates overhead yoke and pull-rod assemblies. *Cleaner installations* . . . any leakage is confined to frame cradle by gravity. *Natural valve motion* . . . fewer parts needed. *Low center of gravity* . . . reduces vibration that can cause piping stress and fatigue. *Safer maintenance* . . . does away with ladders and neck-craning. *Easier maintenance* . . . greater accessibility.

There's a wide selection of top-performing "Oilwell" Triplex and Quintuplex pumps for waterflood applications, LPG Flood, Pressure Maintenance, Formation Fracturing, Acidizing and Cementing, Salt Water Disposal, or you name it. Whatever your requirements, call on your "Oilwell" representative for complete information and help in the planning stage.

USS and "Oilwell" are registered trademarks

Off the shelf

It's all on the shelves in an "Oilwell" store, everything from subsurface pumps to mud gauges. Whatever you need in the way of production or drilling equipment, and whenever you need it, your nearest "Oilwell" store can take it off the shelf, load it, and it's no more than a short trip from your lease. That's because there are "Oilwell" stores, sales offices, warehouses and conversion centers (*and* pump shops) located *throughout* the oil country. If you're near oil, you're near an "Oilwell" store.

USS

Oil Well Supply Division of United States Steel

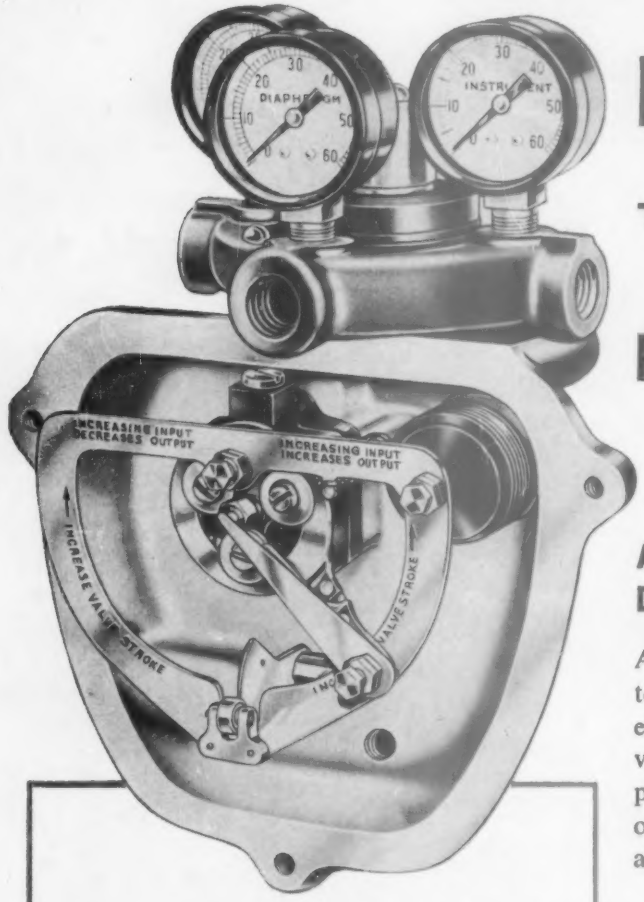
Executive and Export Offices: Dallas, Texas

A new concept in design makes possible the...

FISHER

TYPE 3560 VALVE POSITIONER

V/P



Assured product performance through DYNAMIC ANALYSIS engineering

Application of mathematical techniques of design to pressure control systems has enabled Fisher to eliminate the conventional approach in the development of the new V/P valve positioner. It has provided the V/P with the following combination of characteristics and performance . . . unobtainable in any other type of valve positioner.

SMALL AND COMPACT . . . only 6⅝" wide and 8¾" high (with gauges).

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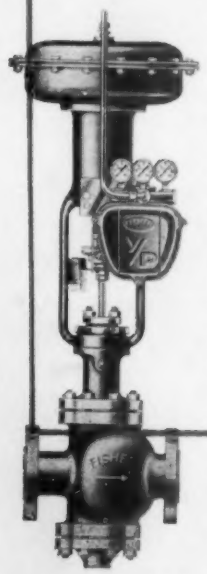
EASILY REVERSIBLE . . . reversed by simply moving flapper arm from one beam quadrant to the opposite quadrant.

CHARACTERIZED CAMS . . . offer wide flexibility in valve characteristics.

PERFORMANCE DATA

Hysteresis, (Average)	0.0012"
Linearity	as required. Change cams to obtain desired characteristics
Sensitivity	0.14 psi
Resolution Sensitivity	0.002 psi
Repeatability	±0.0003"
Stroking Speed	0.37 in/sec.
Air Consumption	10 scfh
Break Frequency (5% of instrument pressure range)	3.9 cps
Break Frequency (3% of instrument pressure range)	4.6 cps

The above performance data was taken from laboratory tests on a Type 657 diaphragm actuator, Size 40, with 1½" travel. Instrument range 3 to 15 psi.



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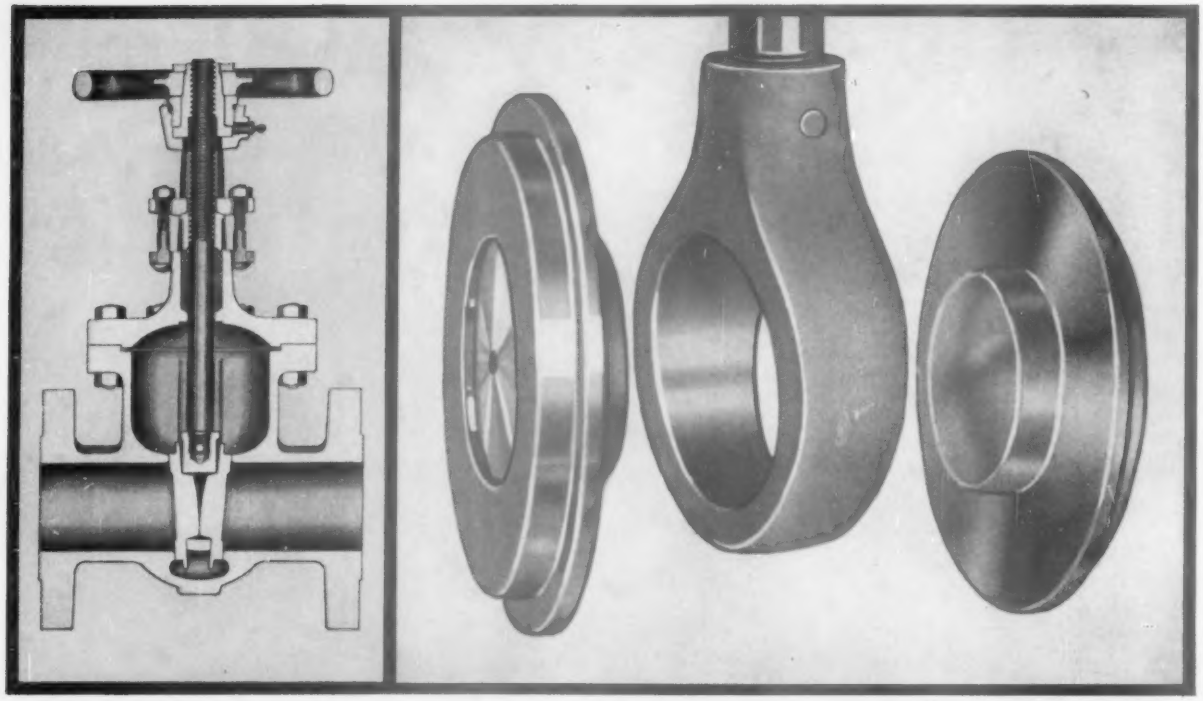
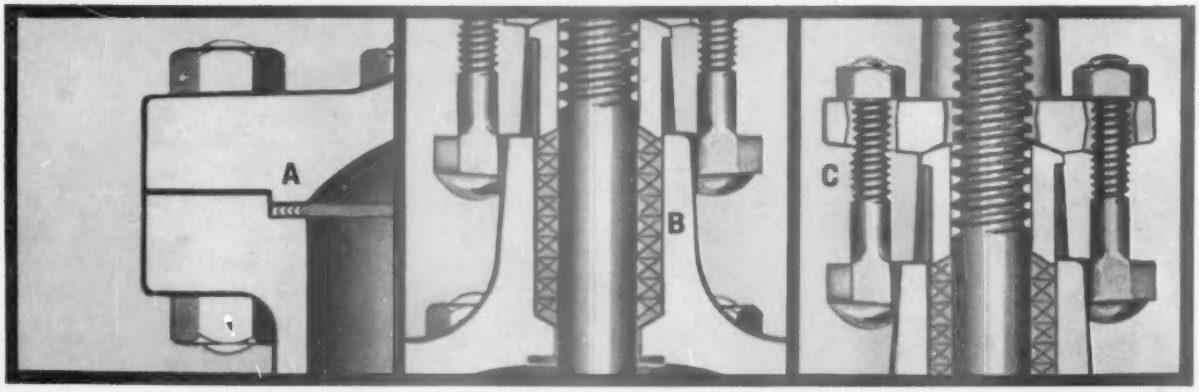


New 300 & 600-Pounders extend Crane line of stainless steel gate valves. Feature unique, free rotating, split-wedge disc.



The unique Crane split-wedge disc design features two identical disc halves, fitted back to back in a carrier that is fastened to the valve stem. The moment the lower portions of the disc halves contact the seats, the carrier exerts uniform pressure on the beveled sides of both disc trunnions, forcing the disc halves outward against the seats. This results in a perfect seal and long trouble-free valve life. Free rotation of disc halves prevents wear and galling, keeps seat faces clean.

Other quality features include **(A) Recessed, spiral wound bonnet gasket** which permits face to face abutment of body and bonnet flange. Provides predetermined gasket loading. **(B) Extra deep stuffing box** for tightness and long life. **(C) Thru stud-bolts** for easy upper valve servicing.

There's a wide choice of Crane Stainless Steel Gate Valves in 18-8 SMo or CRANELOY 20 in 150, 300 and 600 Pound Classes with screwed or flanged ends, temperatures up to 800 F. (300 & 600 Pound) . . . up to 500 F. (150 Pound).

For complete details contact your Crane Distributor. Or write to Crane Co., Dept. G, Industrial Products Group, 4100 South Kedzie Ave., Chicago 32, Illinois. In Canada: Crane Ltd., 1170 Beaver Hall Square, Montreal.

AT THE
HEART
OF HOME AND
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CRANE

VALVES AND PIPING
ELECTRONIC CONTROLS
PLUMBING
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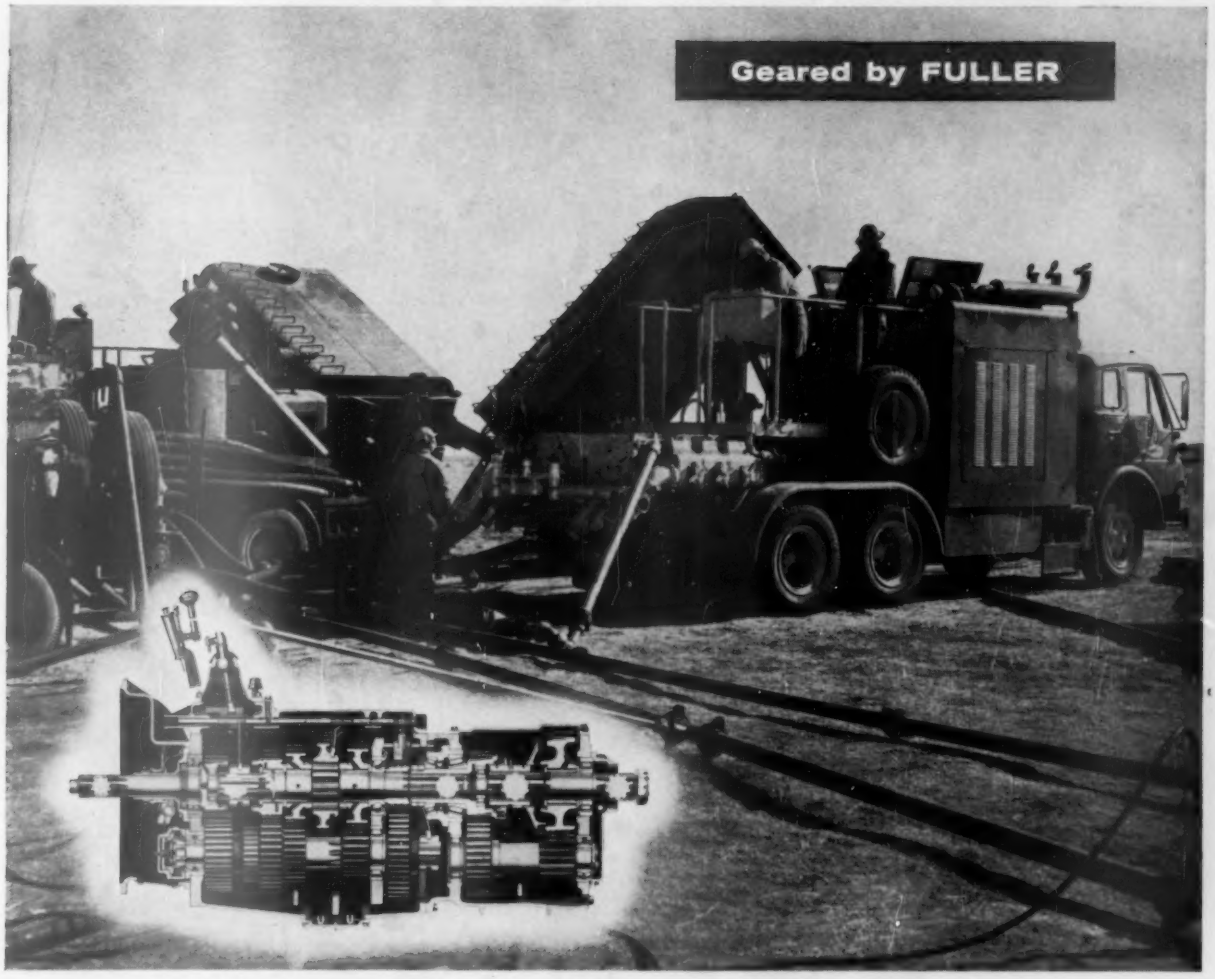

The BJ Pacemaker Fracturing Unit mounts two Model GAA Engines on the machinery deck to drive the BJ pumps. Each of these 500 hp engines is geared through a separate Fuller R-1550 9-speed ROADRANGER Transmission. The vehicle is a VCOF International geared over the road and cross-country by a Fuller Model 5-A-62 5-speed Transmission.

for PERFORMANCE and RELIABILITY

"We needed ruggedly engineered heavy duty transmissions with close, even steps to transmit 500 horsepower from engines to pumps," states Matt Riordan, Vice President of BJ Service, Inc., a Borg-Warner subsidiary. "The Fuller R-1550 ROADRANGER Transmission provides nine even ratios with short steps and allows smooth shifts with only one shifting lever. The 9-speed ROADRANGER also gives us the reliability we must have when these units are in the field.

"Actually we operate these transmissions in the reverse order of most applications. We start in high gear and shift down as full pumping pressures are applied. We can depend on the Fuller Transmissions—and when you have units stationed on 24-hour call in seventy field stations throughout the U. S. and Canada, dependability ranks right along with performance. We get both from Fuller."

FULLER TRANSMISSION DIVISION

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GENERAL OFFICES: HOUSTON, TEXAS

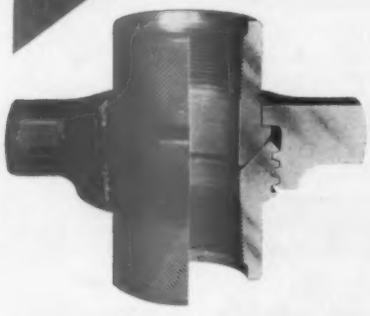
STANDARDIZE WITH WECO UNIONS

cut rig-up and rig-down costs . . .

increase operating and maintenance efficiency

The advantages of standardizing with WECO Unions on your drilling rig are numerous and valuable. Piping make-up and break-out time is reduced to a minimum . . . manifolds and many pipe assemblies can be moved intact . . . valves and other fittings can be installed with a few turns of the wing nut. With the most complete line of wing unions in the world, WECO has the size, type and pressure rated unions you need for every service on the drilling rig.

Standardizing with WECO Unions means you can transport equipment, such as standard pipes, pumps, mud tanks, and other piping assemblies from one rig to another. Streamline and modernize your operations by standardizing with WECO Unions on all your rigs. Ask your WECO representative about the benefits and advantages of the WECO Union standardization program.



WECO FIG. 400
4000 psi test
Sizes: 2" through 12"

The complete line of WECO Unions includes sizes 1" through 12", pressure ratings 1000 psi through 15,000 psi.

WECO

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Division of CHIKSAN COMPANY
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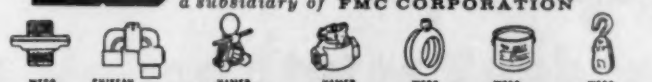
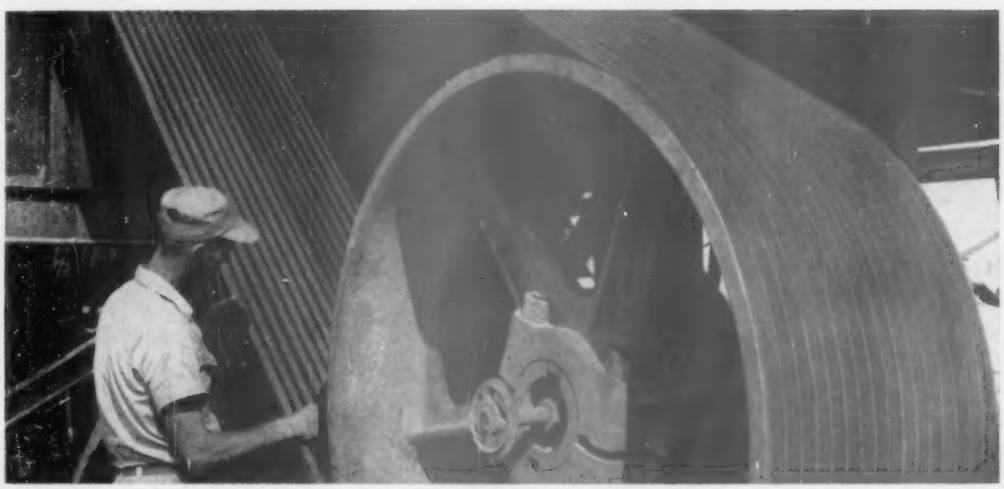


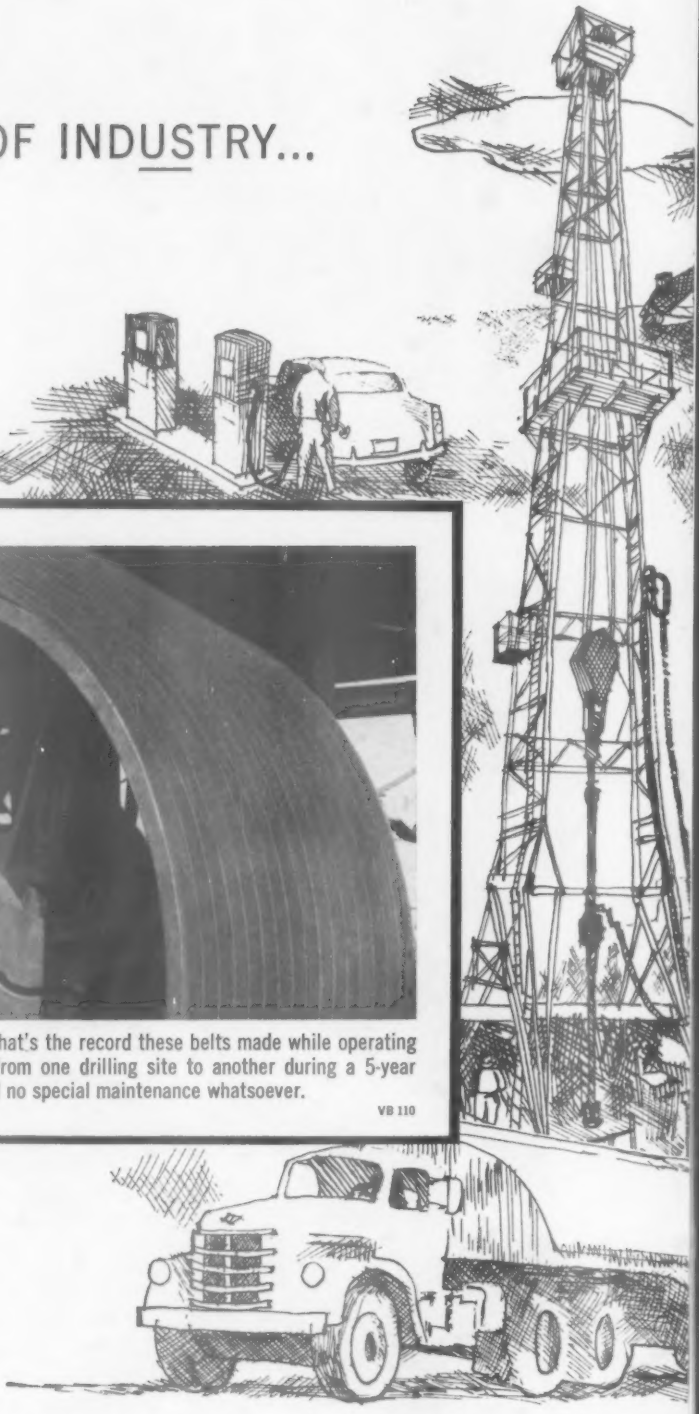
US RUBBER

AT THE HEART OF INDUSTRY...

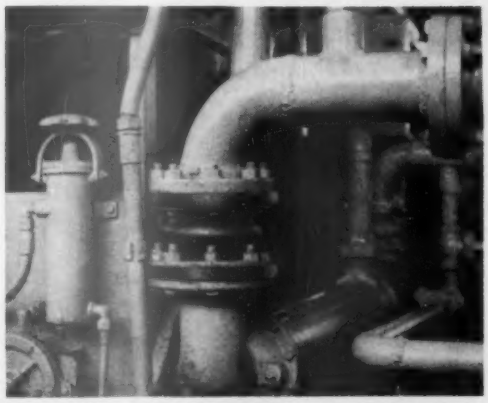


"445,000 feet of hole with one set of U. S. Royal V-Belts," that's the record these belts made while operating almost constantly, exposed to the rigors of Texas climate, moved from one drilling site to another during a 5-year period. And this on-the-job-proven set of U. S. Royal V-Belts required no special maintenance whatsoever.

VB 110

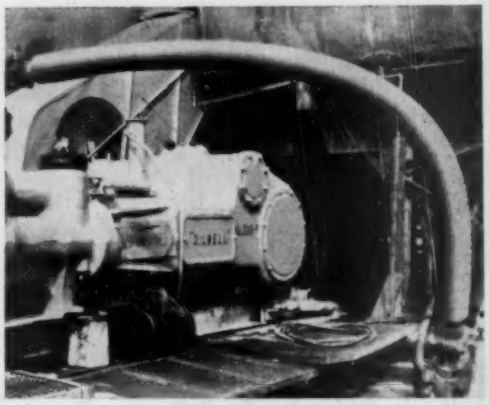


Wherever you find a roughneck... in desert wastes, in steaming jungles, on offshore drilling rigs, you'll find US Industrial Rubber Products making the exploration for, the drilling to, and the pumping of oil more efficient and more profitable.



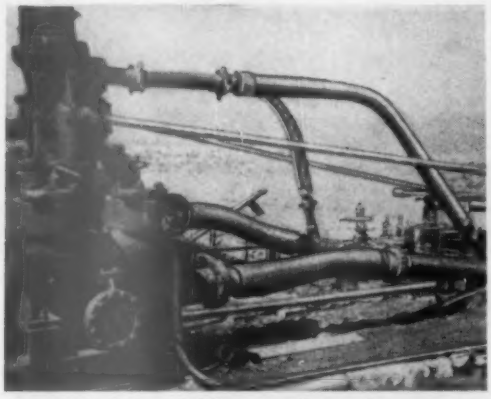
Absorbing expansion and contraction forces before they can damage piping and equipment, tough US Expansion Joints compensate for misalignment and soak up vibration as well. Their ability to contain pressures, to serve as a permanent, maintenance-free part of the piping system is indicated by the fact that they are often painted over with the rest of the equipment.

EJ 102



Keeping pumps operating smoothly in the "oil patch," U.S. Matchless® Packings withstand pressures to 8,000 lbs., will self-adjust to reduce wear and tear on rods and plungers, minimize friction. And U.S. Matchless Packings resist oil base, acid and caustic treated muds. U.S. Matchless is the up-to-date packing for modern drilling equipment.

P 102



For extra-heavy drilling requirements, you can't beat US Heavy-Duty Mud Pump Suction Hose. This hose won't collapse as does lightweight, inferior hose and, despite its great strength, is flexible enough to allow quick adjustment of the intake line in the slush pit. US Mud Pump hose keeps air out of the line, keeps mud ends from blowing, reduces wear on valves and pistons.

H 112

For every industrial rubber product need, turn to US. For Conveyor Belts, V-Belts, the original PowerGrip "Timing"® Belt, Flexible Couplings, Mountings, Fenders, Hose and Packings ... custom-designed rubber products of every description. Discover why U.S. Rubber has become the largest developer and producer of industrial rubber products in the world. See your U.S. Rubber Distributor or contact US directly at Rockefeller Center, New York 20, N. Y.

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MECHANICAL GOODS DIVISION

O·C·T presents three new hangers

for the C-22 Casing Head

The new O·C·T C-22 casing head accepts a family of three new heavy-duty, interchangeable hangers. This straight-bore casing head is designed to support maximum loads.

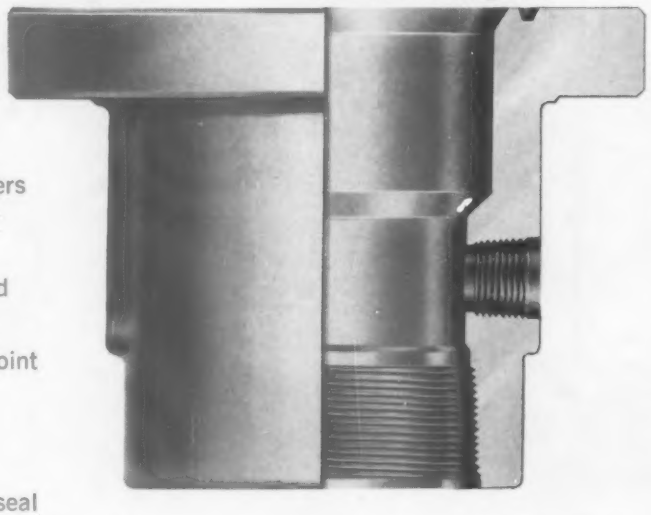
Hangers designed for the C-22 casing head include the C-21, C-21-W, and C-22. All three hangers are interchangeable with each other and with O·C·T's tubingless completion hangers. These hangers feature O·C·T's improved slips that hold extreme loads without crushing the casing.

Each hanger can support weight beyond the joint strength of the pipe iself, with minimum casing deflection. All three can be lowered through blowout preventers.

- **C-21 casing hanger:** slips, slip bowl, and floating seal ring that provides positive annulus packoff.
- **C-21-W casing hanger:** welded-to-casing version of the C-21.
- **C-22 casing hanger:** single-unit sealing element, slip bowl, and slips; automatic seal; spring-loaded latch.

See your nearby O·C·T representative for further information, or write to Oil Center Tool Company, P. O. Box 3091, Houston, Texas.

C-22 Casing Head



where progress is a daily practice

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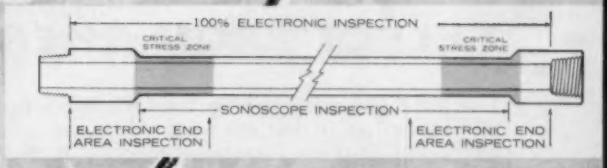

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if you always
use the same acid...

YOU MAY BE MISSING THE CUSTOM BLENDED BENEFITS

OFFERED BY HALLIBURTON

If acidizing will work, *custom blended* acidizing should work even better. This thinking has led Halliburton to the development of many refinements and modifications of acid treatments as an aid to the most effective, economical well stimulation techniques.

These *custom blended* acid solutions are complimented by modern Halliburton surface and downhole equipment designed to do the *best job* with minimum downtime... and customer economy in mind. Add to this the skilled Halliburton men – who know how to get the most from material *and* machines, and you have a winning combination... and it is as near as your 'phone.

SELECT FROM THESE CUSTOM BLENDED ACIDS...

Use MSA for minimum corrosion, maximum controlled action in hot holes... MSA can serve as a displacing fluid for cementing plugs... It becomes a perforating medium and a treating solution in one operation... To precede acidizing treatments with stronger, faster acting HCl... and removes some carbonate scales while allowing subsurface equipment to remain in the hole. This organic acid with an extremely low corrosion rate and an added surfactant to alter surface and interfacial tension characteristics serves exceptionally in wells with elevated BHT. MSA shows virtually no attack on aluminum pellets, chromium plating or heat treated steels, and adding an inhibitor allows prolonged acid-pipe contact.

Use Regular HCl Acid for stimulation at low cost... Regular Hydrochloric Acid acts in calcareous formations with the most economy as an aid to improving production and as a conditioning agent prior to other well treatments. Regular HCl Acid serves as the basic ingredient in many of Halliburton's chemical treating solutions for production improvement.

Use Penetrating Acid in extremely dense formations... Penetrating Acid lowers interfacial and surface tension characteristics to the range of formation crudes. These wetting properties aid in alleviating the undesirable effect of the "Jamin action," making it easier for spent acids to return... particularly in low pressure formations. This acid also serves as a basis for the formulation of Fe Acid... a highly effective combination of ingredients for disposal and injection wells.

Use N.E. Acid to help prevent emulsion blocks... Non-Emulsifying Acid aids in preventing the formation of viscous emulsions between acid, or spent acid, and crude. With this action fluid compatability is maintained for fast well cleanup after treatment.

Use TGA Retarded Acid for delayed chemical action... True Gelled Acid retards the reaction of hydrochloric acid on calcareous formations. This allows deeper penetration of live acid within the zone being treated... resulting in a greater drainage pattern for increased production... TGA also has silt suspending properties that aid in purging acid insoluble fines after chemical reaction... TGA additives lend low fluid loss characteristics to the retarded acid, increasing the efficiency of crevice acidizing instead of matrix acidizing... TGA, a true gel (with a controlled degree of gellation), lowers friction loss properties.

. . . .THE BEST WELL STIMULATION TREATMENT

Use Fe Acid in the presence of iron scales . . . Fe Acid is primarily penetrating HCl with other organic acids in the mixture to minimize the undesirable effect of re-precipitation. Many times excessive amounts of iron scales are dissolved when acidizing. These iron salts and oxides are dissolved from pipe, and formation face only to again become solids within the formation crevices when the acid is spent. These solids upon re-precipitation occupy a much larger volume in the flow pattern of a treated zone than when they were scales. Fe Acid is designed to keep these dissolved materials in solution.

Use Thermic Acid where heat is desired . . . Thermic Acid is a hot acid process which requires a two-stage treatment. Magnesium pellets (20-40 mesh) are first pumped into place followed by acid. The heat of reaction between acid and magnesium exceeds 8,000 BTU of heat for each pound of reacted magnesium. An acid concentration above the conventional strength for normal acidizing can be used to compensate for acid spent on the magnesium. Thermic Acid aids in dissolving paraffin and other compounds that are relatively nonreactive to acid without heat.

Remember that acidizing adds only a small percentage to the total cost of putting wells on production . . . and chemical treatment also provides an economical approach for workover operations. Halliburton chemical treatments are designed to provide both at minimum cost . . . call your Halliburton man for planned production stimulation on *your wells!*

275 Service Centers . . .
just minutes away from your well

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There's no danger of over-buying when you specify W. C. Norris Well Head Equipment, for the Norris line is a complete line . . . with a wide range of tubing and casing heads engineered to meet your actual needs. Norris heads offer you high selectivity . . . true economy . . . without sacrificing design, service or safety. You can buy with confidence when you buy Norris. Write for prices and complete literature today!

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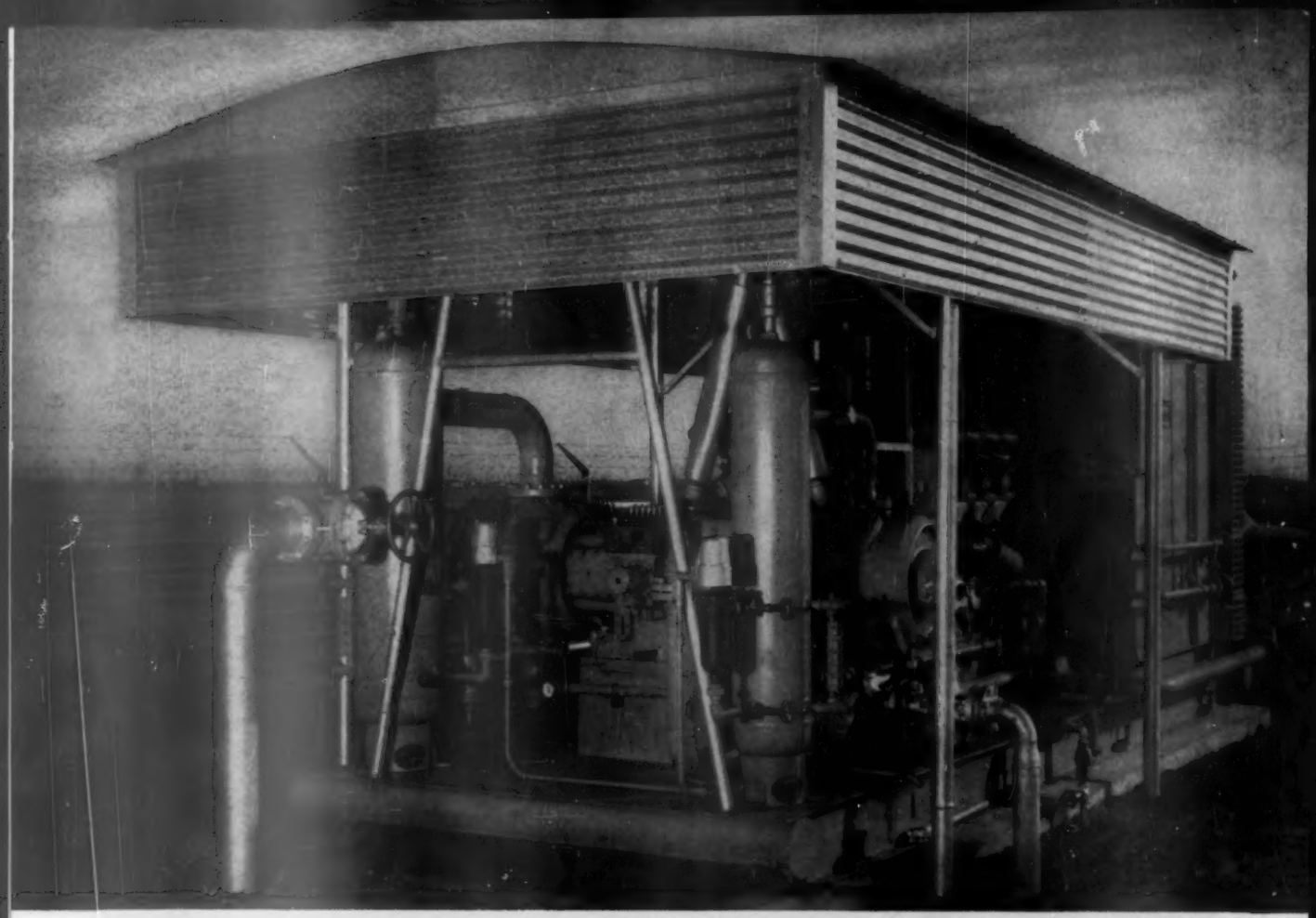
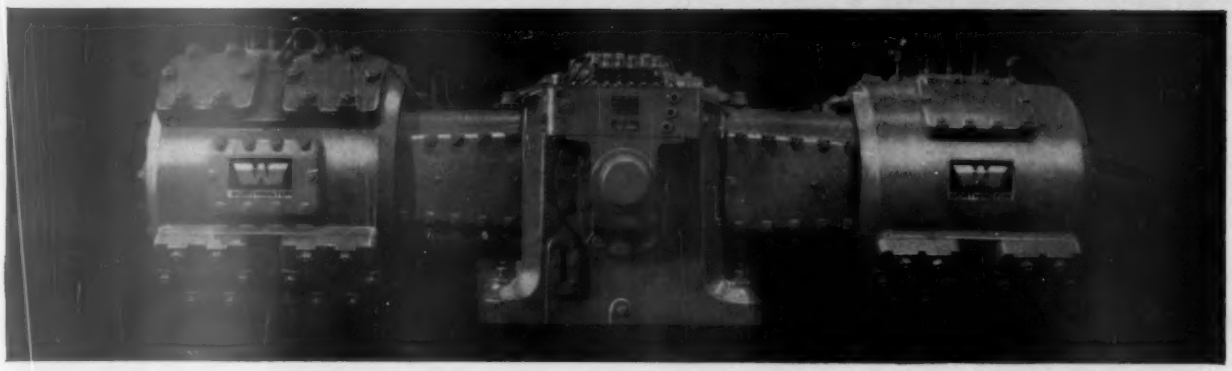




SHOULD YOU TAKE GAS FROM A WELL?

There's a big difference in opinion about when it is profitable to take gas from a well. It depends on price contracts, on company policy of time limit on payout, on alternatives for capital investment and on other factors, such as the economics of the well itself. To lower your well cost picture, Worthington now offers the new CUB compressor.

Through a wide range of cylinder sizes, the CUB handles over 85% of gas field needs. The cylinders are designed for extremely fast field changes to meet changing capacities and pressures.

The CUB cylinder-and-piston arrangement is balanced-opposed. This cuts vibration to a level below other compressor designs. It reduces supporting base requirements and lengthens compressor life.

Main crankshaft bearings in the CUB are the more expensive, spherical-roller-bearing type. You'll find it runs with less friction, runs cooler, and maintains better full end-thrust control.

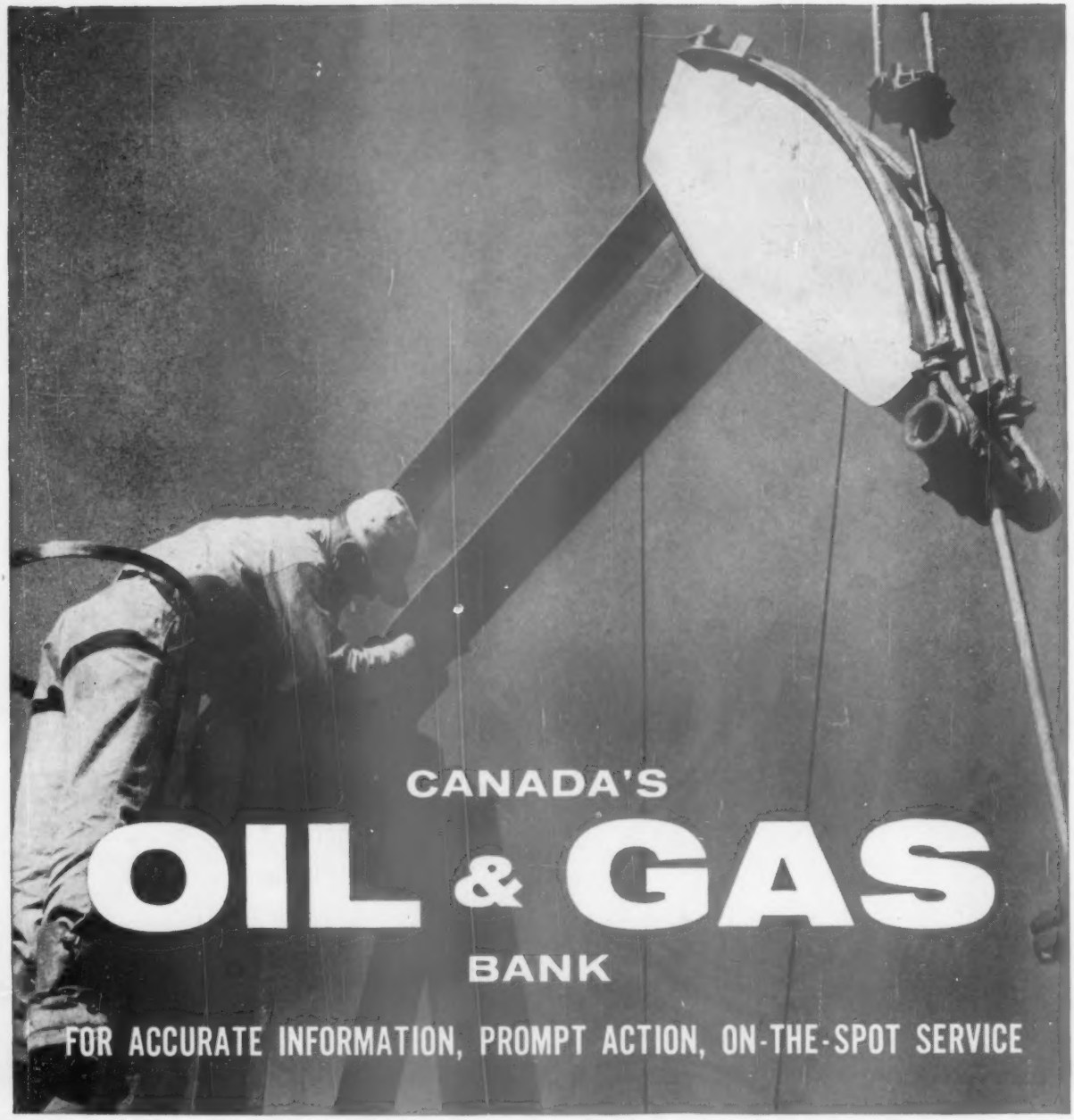
Lubrication in the CUB is improved, too. Oil is continuously cleaned by a built-in filter that is readily serviced without disturbing piping. All lubrication is done by a full, force-feed system. And crankcase oil is water-cooled down to a conservative operating temperature by an oil cooler enclosed in the frame itself.

You'll find, too, that the CUB is compact to make an easier installation. Piping is less, only one water inlet and two water outlets. There are no external oil pipe connections.

For more information on the CUB, write Worthington Corporation, Section 36-19, Harrison, N. J. In Canada, Worthington (Canada) Ltd., Brantford, Ontario. Or call your local compressor packager.

WORTHINGTON

PRODUCTS THAT WORK FOR YOUR PROFIT



With over 300 branches throughout Canada's Western provinces, the Royal Bank can provide complete on-the-spot banking service to those entering the oil and gas industry and to those already established in it.

In addition, the Royal maintains a special Oil and Gas Department, staffed by experienced "oil bankers," which is exceptionally well organized to supply current information

and helpful guidance. This department issues Oil and Gas Bulletins containing current information and statistics that are basic to the Canadian industry. For an up-to-date list of bulletins, write to our Dallas representative, Mr. T. C. Marshall, Room 1523, 300 North Ervay Street, Dallas 1, Texas; or to The Royal Bank of Canada, Oil and Gas Department, 409 Eighth Ave. W., Calgary, Alta.

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The **best** way to lock casing...**can save $40 to $90** per string!

THREDLOK Compound seals casing tighter and stronger than tack welding . . . prevents possibility of heat damage to tempered, high-strength casing. Yet THREDLOK costs *less* than welding!

With THREDLOK, your own crew can lock and seal the lower joints in a casing string for about $10.00. Out-of-pocket costs of welding would be approximately $50 to $100. So THREDLOK can save you $40 to $90 *cash* per string. And the extra protection THREDLOK gives casing threads can save you much more.

Get THREDLOK next time you run casing. Available through Humble Bulk Plants or Humble Oil & Refining Company, Houston, Texas.

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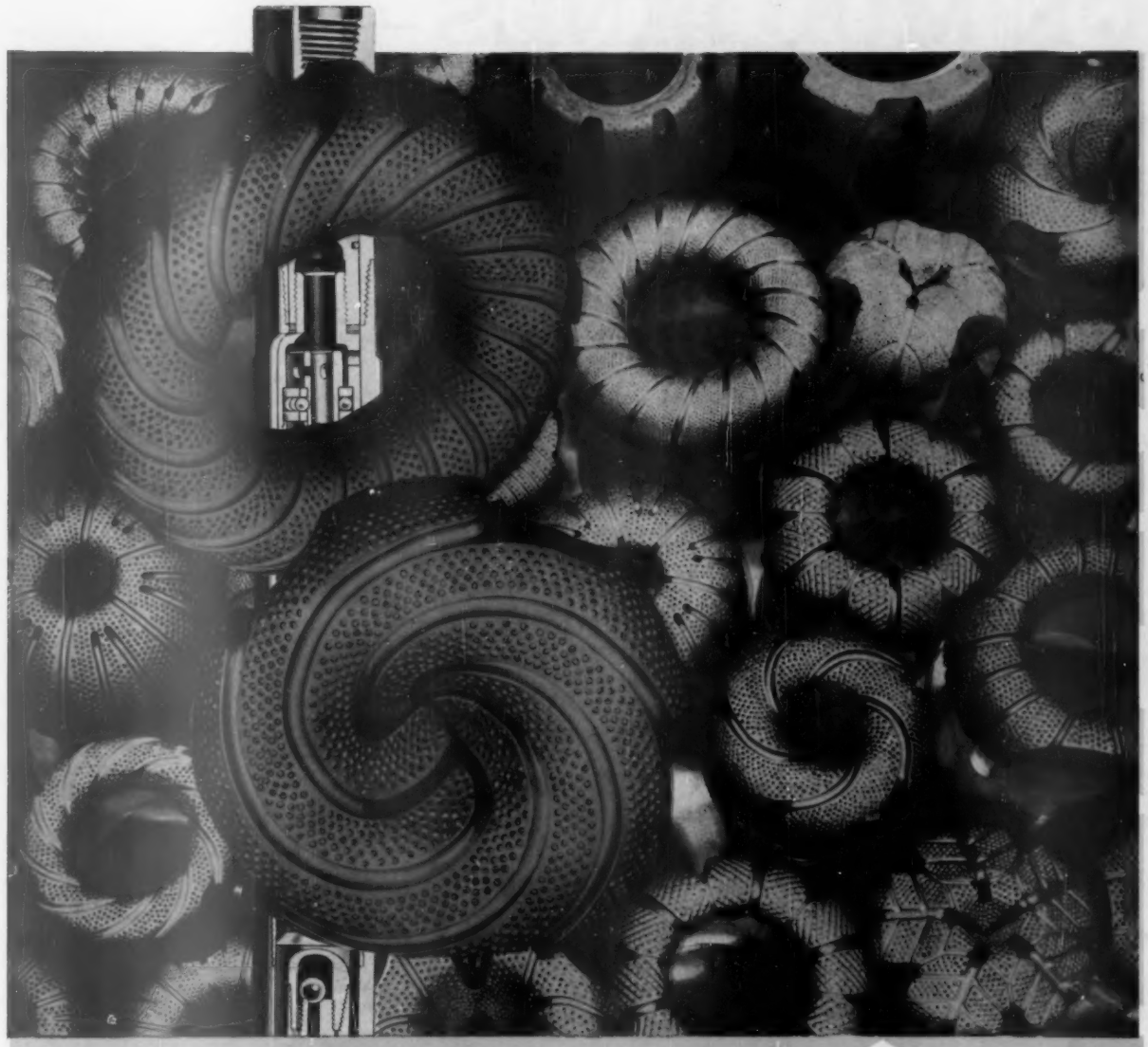

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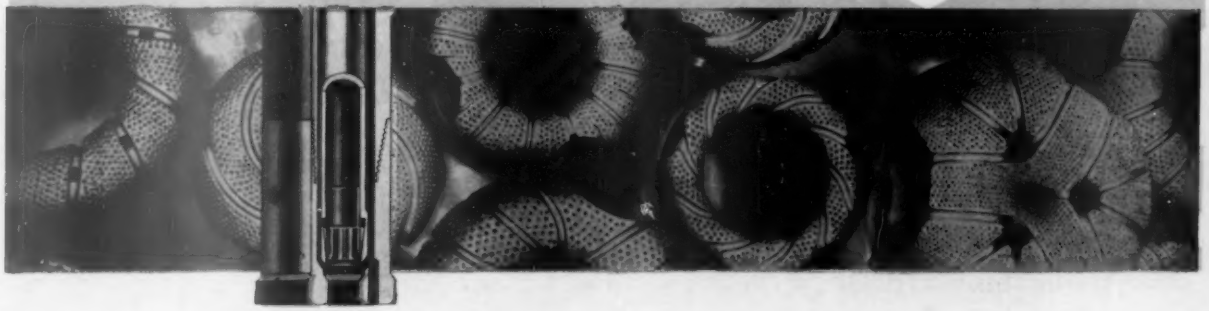
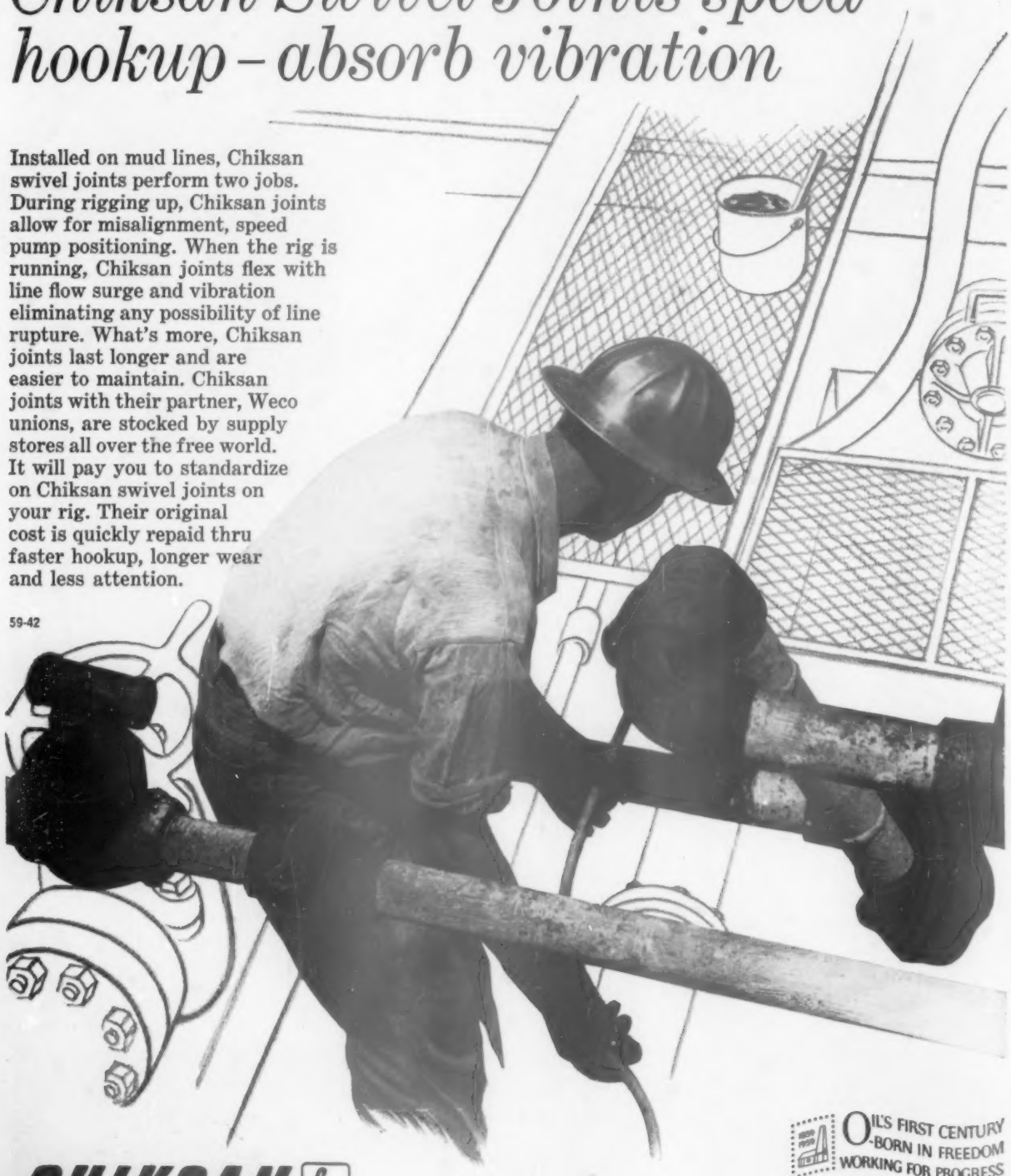


ON MUD LINES –

Chiksan Swivel Joints speed hookup – absorb vibration

Installed on mud lines, Chiksan swivel joints perform two jobs. During rigging up, Chiksan joints allow for misalignment, speed pump positioning. When the rig is running, Chiksan joints flex with line flow surge and vibration eliminating any possibility of line rupture. What's more, Chiksan joints last longer and are easier to maintain. Chiksan joints with their partner, Weco unions, are stocked by supply stores all over the free world. It will pay you to standardize on Chiksan swivel joints on your rig. Their original cost is quickly repaid thru faster hookup, longer wear and less attention.

59-42



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BORN IN FREEDOM
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CHIKSAN fmc

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UNIBOLT PRESSUREMATIC WING VALVE

stands guard around the clock . . . and permits choke changing, too

The new UNIBOLT Pressurematic Wing Valve is an adaptation of the tried and proven UNIBOLT Adjustable Wing Valve with an added automatic closing feature. (Any Adjustable Wing Valves now in Christmas tree and other services may be readily converted to "Pressurematics" by replacing the standard stem/bonnet assembly with the new automatic assembly.)

Heretofore, in order to protect a well against broken flowlines and similar mechanical failures that would permit the well to flow wild, an automatic "high-low" valve has been installed in the manifold beyond the wing valve. Now, a single Pressurematic Valve not only safeguards the well against these hazards but also serves as a fine, easy-operable wing valve.

NO SPRINGS—The design is simple and trouble-free.

PRESSURE SURGE OR DROP CLOSES VALVE—Once the well head and flowline pressures are established, it is an easy matter to determine the automatic operating range of this valve. Then, when pressures rise or fall beyond predetermined limits, the valve closes instantly, automatically.

CLOSES EASILY BY HAND FOR CHOKE CHANGING — Unlike all other "high-low" safety valves, the Pressurematic Valve is an excellent Christmas tree wing valve. A few turns of the handwheel closes it for choke changing. Then, the valve is opened and set for automatic operation by further manipulation of the handwheel.

IT SAVES YOU MONEY—This combination automatic shut-off and wing valve costs little more than the price of a good wing valve or a conventional "high-low" valve alone.

UNIBOLT

THORNHILL CRAVER CO.

P. O. Box 1184, Houston, Texas

As a wing valve, it opens and closes manually for choke changing. Set for automatic operation, it provides 'round the clock protection.

NEW ROCK ISLAND GLASS/REINFORCED EPOXY PIPE

~ A significant development in corrosion control which develops maximum strength because it is

PRE-STRESSED

JUST as with pre-stressed concrete, *pre-stressing* alternate longitudinal and lateral plies of glass roving in Rock Island's new glass/reinforced-epoxy pipe develops maximum, collapse and tensile strength — by placing the load on the *glass* rather than the epoxy resin.

And — as a result of three years of intensive laboratory and field testing — Rock Island has thousands of feet of this significant, new tubing and pipe line (in 2-, 2½-, 3-, and 4-inch I. D. in 20-ft. lengths) performing to high satisfaction in many mid-continent oil fields.

Additionally, Rock Island reinforced-epoxy tubing has been found extremely effective under conditions which require critical corrosion control under high-pulsating pressures. These include: oil production lead lines and tank battery hook-ups; salt water disposal water lines and disposal well tubing; water flood system line pipe and well tubing; as well as chemical industry uses which include corrosive fluid lines and waste water disposal.

For oil field use, Rock Island's new glass/reinforced-epoxy pipe has been designed for rugged, practical application. Upset ends are fabricated into the tubing, during manufacture, for maximum strength. Tubing can be handled in doubles . . . and regular chain tongs may be used in making up joints. Tubing strings can be suspended on slips. Threaded and coupled joints are used, with standard AST 60° stub threads. Adaptors are available for 8 round E. U. E. and normal pipe thread. Dresser-type couplings may be used.

At this writing, Rock Island's new tubing and line pipe are available in 2″, 2½″, 3″, and 4″ sizes. On special order, 6″, 8″, and 10″ line pipe can be fabricated to user's specifications. Future production scheduling includes larger sizes up to 30 inches in diameter. Detailed information and specifications are available. Contact us—today.

ROCK ISLAND

ROCK ISLAND OIL & REFINING CO., INC.
321 West Douglas Avenue. Wichita Kansas, Phone: WHitehall 3-8981

TRAVELING BLOCK COMBINATION

BLOCK FEATURES — short over-all length, Extra Weight and excellent balance. Johns-Manville "Klipper" Grease seals, E-Z opening guards for quick stringing-up. 17" to 42" Alloy-steel Flame - hardened sheaves. Divider plates between sheaves.

McKissick

McKISSICK PRODUCTS COMPANY
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McKISSICK BUILDS A BETTER BLOCK FOR EVERY PURPOSE!

NEW FEEDWATER HEATER TUBE

provides high strength ... at lower cost

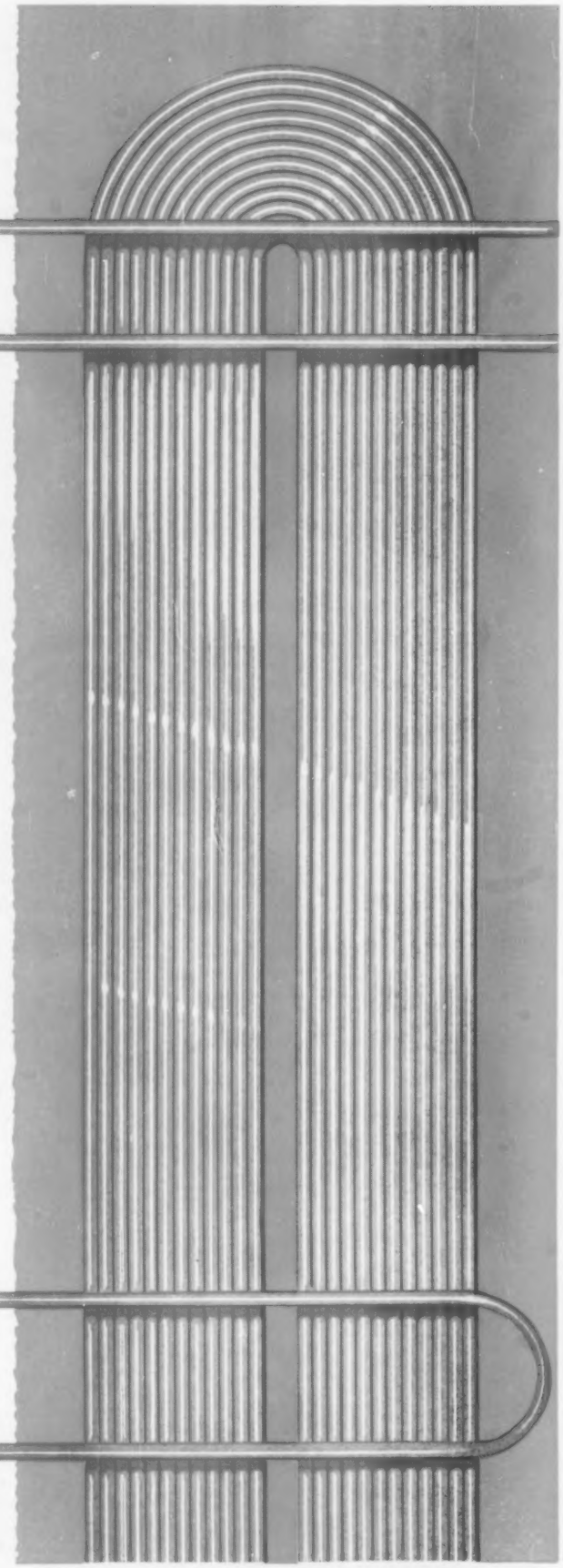
ANACONDA CUPRO NICKEL, 30%-707 provides important money-saving advantages over generally used feedwater heater tube alloys. Approved for condenser and heat exchanger use by the ASME Boiler & Pressure Vessel Code Committee, it offers highly desirable properties for power plant feedwater heaters . . . at lower initial cost.

A point-by-point comparison of mechanical properties is detailed in our Publication B-45.

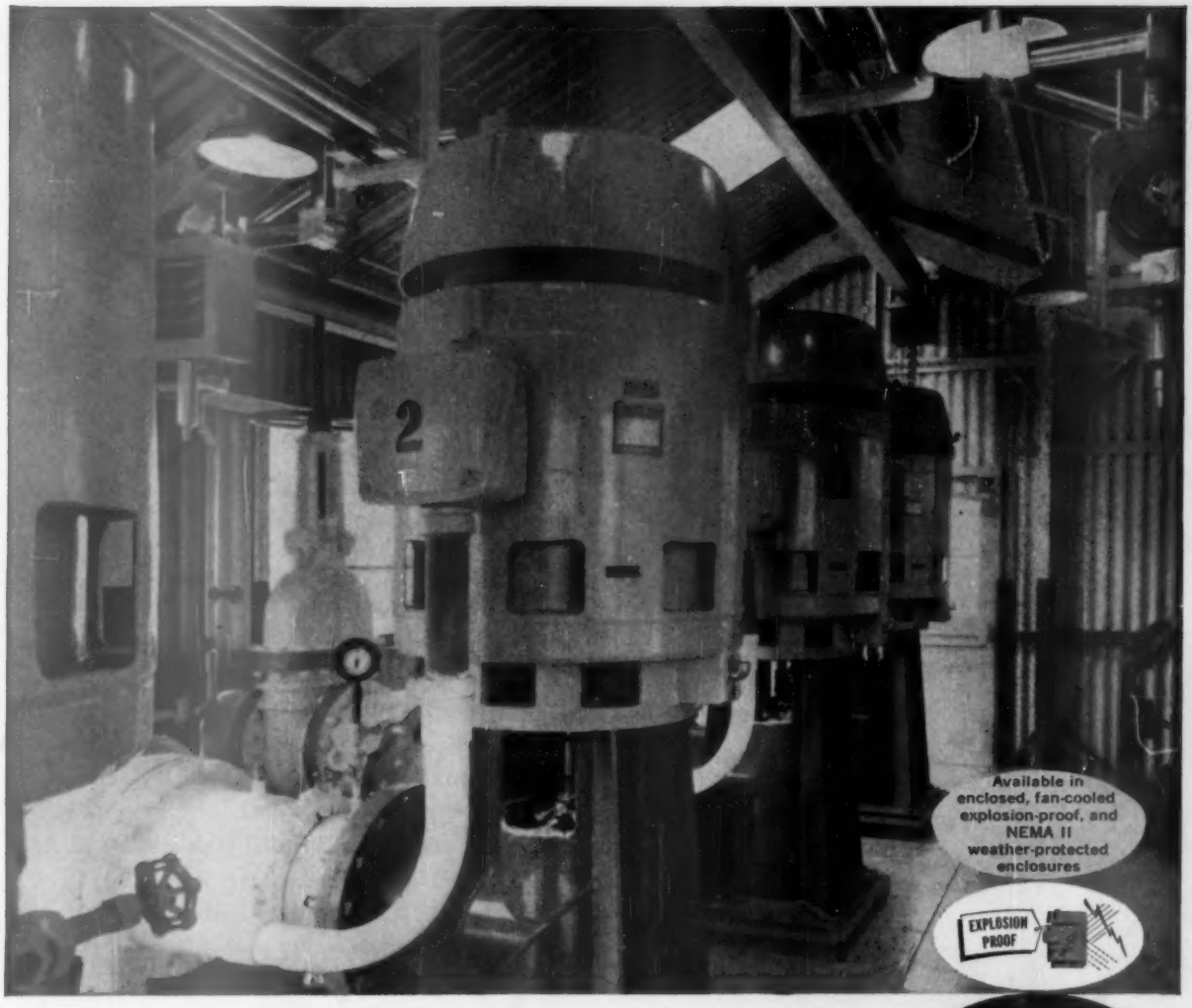
Of course, this high-strength copper-nickel-iron tube alloy is only one of the many Anaconda alloys available for various types of heat exchangers. These include arsenical admiralty, red brass, 10% and 30% cupro nickels, phosphorized coppers, and Anaconda's own Ambraloys, Ambronze, and Everdur®.

For the complete story, ask your nearest Anaconda technical representative, or send for our 44-page Publication B-2 and Cupro Nickel, 30%-707 Publication B-45. Address: Anaconda American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario. 61-920

CUPRO NICKEL, 30%-707
Weldable
High Strength
Corrosion Resistant
Stress-corrosion Resistant



ANACONDA®
AMERICAN BRASS COMPANY



These motors are climatized for trouble-free pumping anywhere!

You can use Louis Allis vertical motors indoors or outdoors

These motors are job-designed to keep your pumps going regardless of their environment. Even under rough conditions and in untended locations, upkeep is extremely low.

For example, new M-G-L insulation and varnishes protect windings against corrosive gases, vapors, moisture, heat...and have high dielectric and mechanical strength for long, trouble-free life.

Louis Allis *climatized* design adds the all-weather protection. The snug but rugged housing and cover will not corrode. Wind-blown rain, snow, sand, and dirt can't get into the motor. The high-volume, low-velocity cooling system breathes air in through screened and baffled right-angle inlets. Thus dust and moisture are not drawn into the motor — nor can foreign matter, bugs or rodents get past the screen. It's extra-quiet, too.

You get duplex-mounted shaft bearings for maximum thrust capacity without misalignment. A self-releasing coupling automatically disengages the pump shaft and eliminates inadvertent damage in case of accidental motor reversal. The motor can be supplied with a non-reverse ratchet that prevents backspin when the motor is shut off and the column of water drains back.

You can choose Louis Allis vertical motors with hollow or solid shaft — in sizes up to 2000 hp. Contact your nearby Louis Allis District Office for application assistance. Or write for Bulletins 2450, 2500 and 2600 to The Louis Allis Co., 449 E. Stewart St., Milwaukee 1, Wis.

OW-205

LOUIS ALLIS

MANUFACTURER OF ELECTRIC MOTORS AND ADJUSTABLE SPEED DRIVES

GUIBERSON'S TYPE H4 *Hydraulic Anchor*

with

MORE FLUID BYPASS

TYPE H4 ANCHOR

The channeled body H4 Anchor gives you four operational improvements — faster going in, better circulation in the hole, faster pulling out and simpler clean-up.

Completely automatic in operation, the H4 incorporates a body designed for unusually large bypass area and tremendous holding power. It has a husky fishing connection on top. Case hardened piston slips are retained by a stainless snap ring that holds the slips in retracted position while going in or pulling — keeps the slips from dragging on the casing wall.

We recommend the H4 for holding down production-type packers in acidizing, fracturing or other below packer pressuring operations. The H4 not only improves circulation, but speeds up operations and cuts down maintenance costs.

Guiberson H4 Anchors are individually tested and available in a full range of casing sizes.

Better be Safe than Sorry — go Guiberson

THE GUIBERSON CORPORATION
DALLAS, TEXAS. U. S. A.

PRODUCTION, DRILLING AND WORKOVER SPECIALTIES, MOLDED RUBBER PRODUCTS

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Durable paints that keep uniform color

That's what you get when you specify paints made with M50® Basic Lead Silico Chromate pigment for your gas stations and tank trucks.

Keeping stations looking bright and inviting to customers can be a real problem. You can minimize this problem by specifying paints made with *M50*® Basic Lead Silico Chromate pigment—the pigment that puts anti-corrosion protection in every coat . . . plus weather resistance against fading and chalking.

M50 pigment provides "Defense-in-Depth"—keeps paint *uniformly* bright and attractive longer.

In addition to superior corrosion protection, *M50* pigment permits an *unusually wide range of color selection.* Paints made with *M50* pigment can be compounded in bright hues, soft pastels and other color variations to spruce up your gas station signs, pumps and tank trucks...make them attractive outdoor advertisements for your company.

Next time you buy paint for decorative metal protection, specify paints made with *M50* Basic Lead Silico Chromate—the pigment that puts anti-corrosion protection in every coat *and* provides durability, uniform resistance to weathering and wide color range.

M50 *an* **oncor**® *Pigment...A Development of* **National Lead Company**

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YOU CAN COUNT ON POWELL VALVES

Performance proves it, year after year—you can count on Powell Valves to help you solve the toughest flow control problems found in refineries and petrochemical plants.

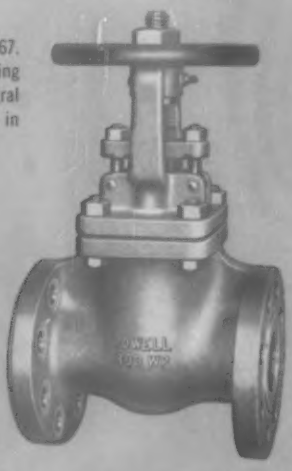
This truly dependable performance results from many things—among them Powell's engineering know-how, accumulated during 115 years of valve manufacturing . . . and skillful use of the widest selection of quality materials—bronze, iron, steel and alloys.

Then, too, you can count on getting the Powell Valve you need, when you need it. That's because Powell maintains a network of distributors backed up by factory inventories, warehoused "ready to go."

Get the full story from your nearby Powell Valve Distributor, or write us direct.

300-pound Stainless Steel Gate Valve—Fig. 2467. Bolted flanged yoke-bonnet. Outside screw rising stem. Fully guided solid or split wedges, integral seats. Sizes, ¼" through 2". Also designed in larger sizes, 2½" through 12".

200-pound W.O.G. Semi-Steel Lubricated Plug Valve—Fig. 2207G. Bolted gland type. Worm gear operated. Sizes, 4" through 12". Also available with spur gearing.



600-pound Steel Horizontal Swing Check Valve—Fig. 6061, flanged ends. Bolted cap. Renewable disc and seat rings. Has full flow area when valve is fully open. Sizes, ½" through 8".

150-pound Steel Gate Valve —Fig. 1503, flanged ends. Bolted flanged yoke-bonnet. Outside screw rising stem. Interchangeable solid or split wedges, renewable seats. Sizes, ¼" through 30".

Refer to our catalog in Chemical Engineering Catalog.

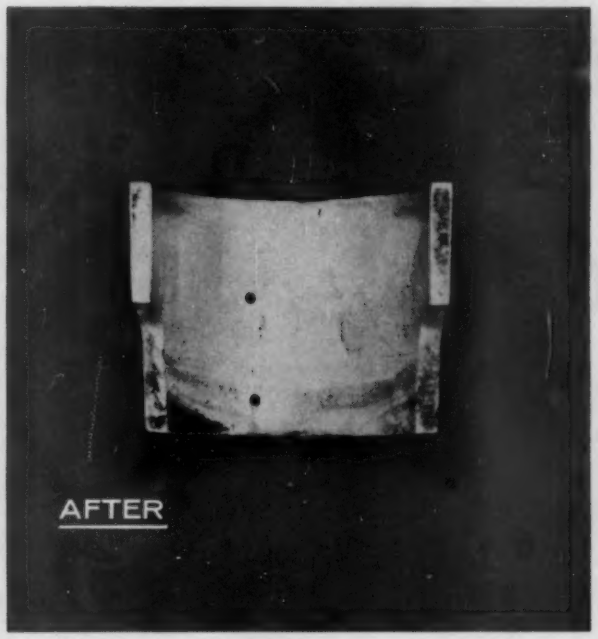
115th year of manufacturing industrial valves for the free world

POWELL DEPENDABLE VALVES

THE WM. POWELL COMPANY CINCINNATI 22, OHIO

Du Pont *Petroleum Chemicals* News

Number 110 in a series of bulletins for the Petroleum Industry OCTOBER • NOVEMBER 1961



Du Pont's multifunctional additive, DMA-4, cleans carburetors and keeps them clean

Carburetor detergency is a striking example of the performance values you can add to gasoline with Du Pont DMA-4.

The carburetor throat liner you see above illustrates how this additive cleans up power-robbing deposits.

On the left, the liner is coated with residue after exposure to an untreated premium gasoline, under severe test conditions. On the right is the same liner after only two hours additional operation under normal operating conditions using the same gasoline treated with DMA-4 at a concentration of 10 pounds per thousand barrels.

Results of other tests have demonstrated that six pounds of DMA-4 per 1,000 barrels of gasoline will prevent deposit accumulations even under the severe conditions utilized to develop the "before" build-up shown above.

The "clean – keep clean" detergency action of DMA-4 is, however, only one of the performance values offered by this Du Pont additive. DMA-4 also offers:

- *Anti-stalling properties.* DMA-4 sets up a protective film that makes throttle plates and other internal surfaces water repellent, thus preventing stalling due to ice formation on cool, damp days.
- *Rust prevention.* The protective film also protects metal surfaces (engine parts as well as pipelines and storage tanks) from corrosion.
- *Phosphorus credit.* DMA-4 contains phosphorus compounds of the type helpful in suppressing surface ignition and spark plug fouling caused by combustion chamber deposits. The concentration of other phosphorus additives can, therefore, be reduced proportionately to obtain minimum treating costs.

Descriptive Bulletin Available

A product bulletin describing DMA-4 is available. To obtain your copy, and to find out how DMA-4 may add new performance and sales values to your gasolines, contact your Du Pont Petroleum Chemicals Division representative.

How you gonna keep 'em . . . ?

Keeping your "down on the farm" petroleum customers may depend on a lot of variables.

To help you understand the

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

OVER ▶

Du Pont *Petroleum Chemicals* News

(continued–How you gonna keep 'em . . .)
farmer-buyer of gasoline, we have extracted facts pertaining to farmers and their buying habits from our nationwide "Profile of the Motorist" survey.

These data are available to you in a new break-out report entitled "The Farmer".

Contents of this report include such subjects as credit card vs. charge accounts, loyalty to a single station, and the farmer's experiences with trading stamps and price wars.

Copies of "The Farmer" summary are available to interested parties in the oil industry as a Du Pont service. For your copy, get in touch with your Du Pont Petroleum Chemicals representative.

SEATTLE DISTRICT MANAGER

ROBERT E. HOLETON is District Manager of our Seattle office.

Under the watchful eye of an uncle who "insisted that I must learn something about everything," Bob spent his early years at summer jobs that ranged from helping to train racehorses to printing, deep-sea diving and sand-hogging.

In 1933, he came to Du Pont after completing premedical requirements. Bob continued his schooling while working, finishing as an organic chemist at Temple University in 1943. He started as a technician in our Eastern Laboratory, was progressively promoted to higher responsibilities in eight Du Pont Laboratories, and joined the Petroleum Chemicals Division as a sales service representative in 1949. He has been Seattle District Manager for seven years.

His technical background and research experience have served Bob well in helping petroleum refiners in the Northwest through his knowledge of antiknocks and other petroleum additives.

Bob and his wife, Rachel, live in Bellevue, Washington. They have five children.

The show about the road is now on the road

Every road in America leads to adventure.

This, in seven words, is the theme behind one of the oil industry's latest travel development tools – Du Pont's half-hour color movie, "Highway Holiday."

"Highway Holiday" is a 16mm version of the Cinemascope feature "Down the Road," which is now being distributed to theaters across the nation by 20th Century-Fox. "Holiday" is designed for non-paying showings to any interested group. Both films are part of Du Pont's marketing services to the oil industry.

"Highway Holiday" takes the audience to all corners of the American continent – from the sweeping highway across the Painted Desert to a historic old village in New England, from the gleaming sands of Daytona to the majestic mountains of Canada, from Quebec to Mexico.

All this travel has a meaning. "Highway Holiday" will encourage a greater appreciation of the heritage and beauties of America, and stimulate motorists' interest in seeing them first-

hand through the convenience and comfort of the family car.

Prints available

You can obtain prints of "Highway Holiday" for showing to clubs and other groups, or for local television use. The film is intended to provide you, as a marketer of gasoline and other oil products, with a *broad* "expand-the-demand" promotion, as a backdrop for your own travel development activities.

For further information, contact your Du Pont Petroleum Chemicals representative.

Railroad learns what happens when it stops using FOA-2

Not long ago, a leading railroad tried an interesting experiment:

They had been using Du Pont FOA-2 to keep diesel locomotives free from filter plugging and other potential fuel problems. At one point, however, they felt that the sludge problem wasn't severe enough to justify continued use of FOA-2 in certain fuels. They decided to find out.

Shortly after the test started, several cases of fuel incompatibility were reported for the first time; filter plugging increased; and it was quickly found that the cost to replace the filters was more than the cost of the FOA-2 they had previously used.

Today, this railroad is once more using FOA-2 to reduce sludging and keep filters clear. Costs and maintenance worries are once more back in line.

TELEPHONE NUMBERS FOR SALES OFFICES

	Area Code*	Telephone No.
Chicago 3, Illinois– 8 S. Michigan Ave.	312	RA 6-8630
Houston 2, Texas– 702 Bank of Commerce Bldg	713	CA 5-1151
Los Angeles 17, California– 612 S. Flower St.	213	MA 4-1354
New York 20, New York– 45 Rockefeller Plaza	212	CO 5-2342
Philadelphia 2, Pennsylvania– 3 Penn Center Plaza	215	LO 8-3531
Pittsburgh 22, Pennsylvania– One Gateway Center	412	AT 1-2933
San Francisco 4, California– 111 Sutter St.	415	EX 2-1934
Seattle 3, Washington– 4003 Aurora Avenue, North	206	ME 2-6977
Tulsa 19, Oklahoma– 1811 South Baltimore Ave.	918	LU 3-8581
Canada		
Toronto 12, Ontario– Du Pont of Canada, Limited Petroleum Chemicals, 85 Eglinton Avenue, East	416	HU 1-6461
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Better things for better living
. . . through Chemistry

Du Pont Antiknocks and other Petroleum Additives

OVER

ADVERTISEMENT–Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

Printed in U.S.A.

1¾" Wilson F. J. Drill Pipe (Left Hand)
Cross Over Bushing (Left Hand)
2¼" EUE Tubing
Die Collar (Left Hand Catch & Connection)
2¼" Wilson F. J. Washpipe (Left Hand)
Fish
2¼" Rotary Shoe

NEW from Wilson Supply Fishing Tool Division

2¼" O. D. Flush Joint Washpipe

The Engineering Research and Development group at Wilson Supply Fishing Tool Division has come up with the answer for operations inside tubingless completions and small diameter pipe with its new 2¼" O.D. Flush Joint Washpipe. And this rental pipe is available with either right-hand or left-hand threads. Left-hand threads make it possible to washover, back-off and retrieve — all in one operation.

All the handling tools for the right- and left-hand strings are available, too . . . Taper Taps, Subs, Lift Plugs, Safety Clamps, Rotary Shoes and the Wilson PS-70 Power Swivel can provide the rotary power for this new 2¼" Washpipe.

For the latest in fishing tool equipment . . . for the best in service, call your Wilson Supply Fishing Tool Service Point. They have the men and the tools to handle your job *quickly . . . safely!*

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HOUSTON, TEXAS

1302 Conti Street, P. O. Drawer 19, Houston, Texas
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Three different problems...
Three resourceful solutions...

3 NEW TANK CARS FROM

GATX

1. Caprolactam "freezes" at 156°F. *General American designed a car to keep it liquid.* 2. Anhydrous hydrochloric acid vaporizes at -117°F. *A new GATX car keeps it chilled.* 3. Lightweight propane travels economically in large bulk quantities. *General American's new 30,000-gallon car* provides the package.

Each of these three new cars typifies General American's ability to meet the needs of shippers of liquid in bulk...in engineering new forms of transportation for faster, more efficient, more economical handling.

If you ship liquids in bulk, call on General American. There's a GATX tank car that can handle your product...or we'll build one for you.

Tank Car Division

GENERAL AMERICAN TRANSPORTATION CORPORATION

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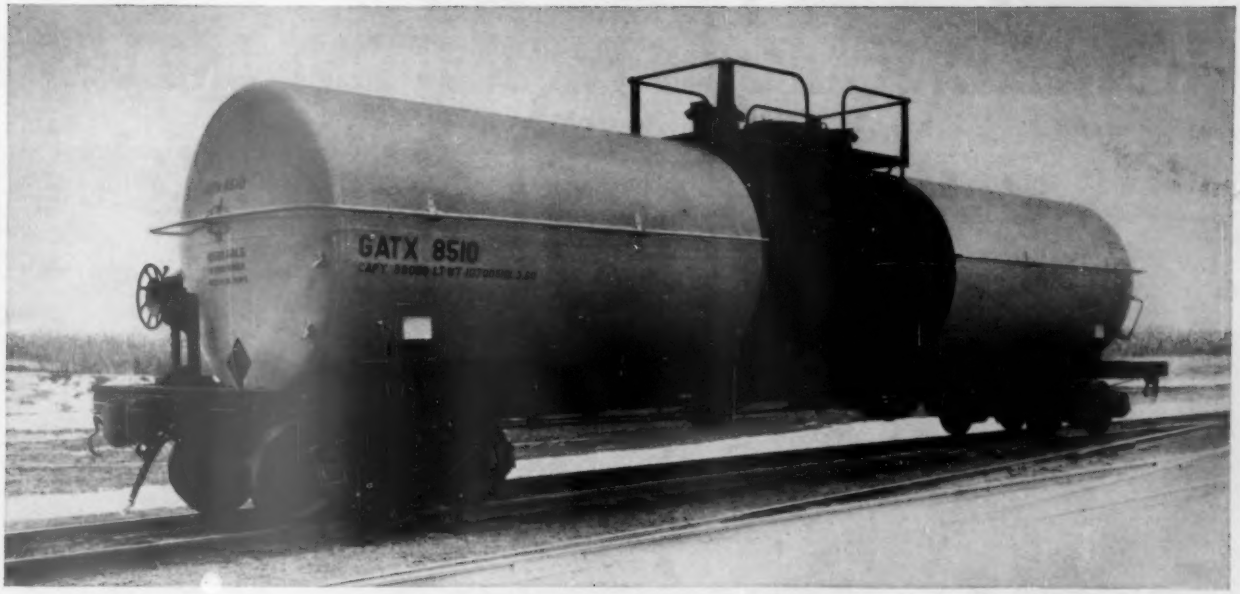
Offices in principal cities

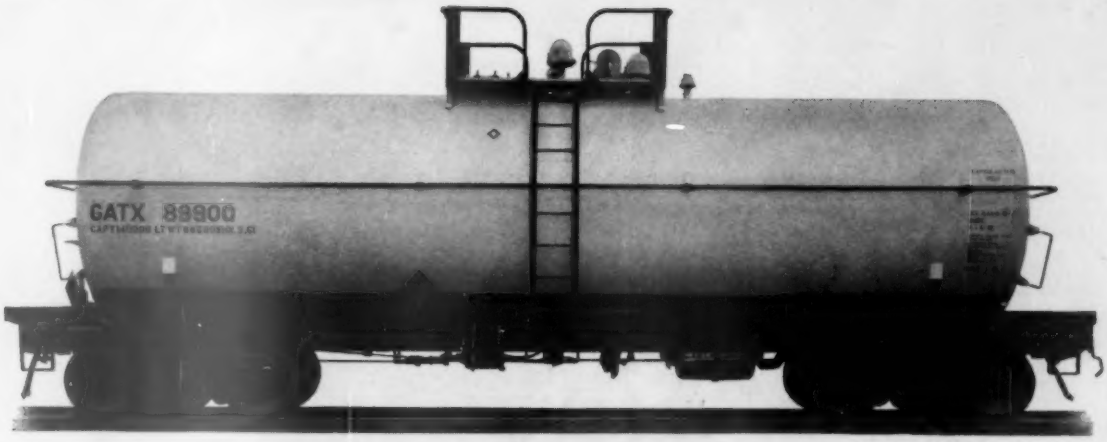
GATX GENERAL AMERICAN TRADE MARK

Among General American's many specially designed cars for transport of rocket fuels and oxidizers, is this car for anhydrous hydrochloric acid. Suspended in the acid is a pressure vessel holding carbon dioxide. If the acid becomes too warm and in danger of boiling away, carbon dioxide is automatically discharged, chilling the lading below its boiling point of -117°F.

10,000 gallon stainless steel tank car, insulated with 10-inch blankets of glass wool and equipped with 22 lines of inside-outside heating coils. Caprolactam is loaded at 176°F. and an inert gas pumped into the car to prevent contact of the lading with normal atmosphere.

This new GATX tank car for LPG represents the first radical change in tank car design in 60 years. The unusual shape of the tank—swelling from 99 inches at each end to 118 inches in the center—gives the car 50% more capacity with only 10% greater length than a 20,000 gallon car. Unitized construction, so successful in modern automobiles, is used to achieve its 30,000 gallon capacity in only 66 feet of length.


GATX 8510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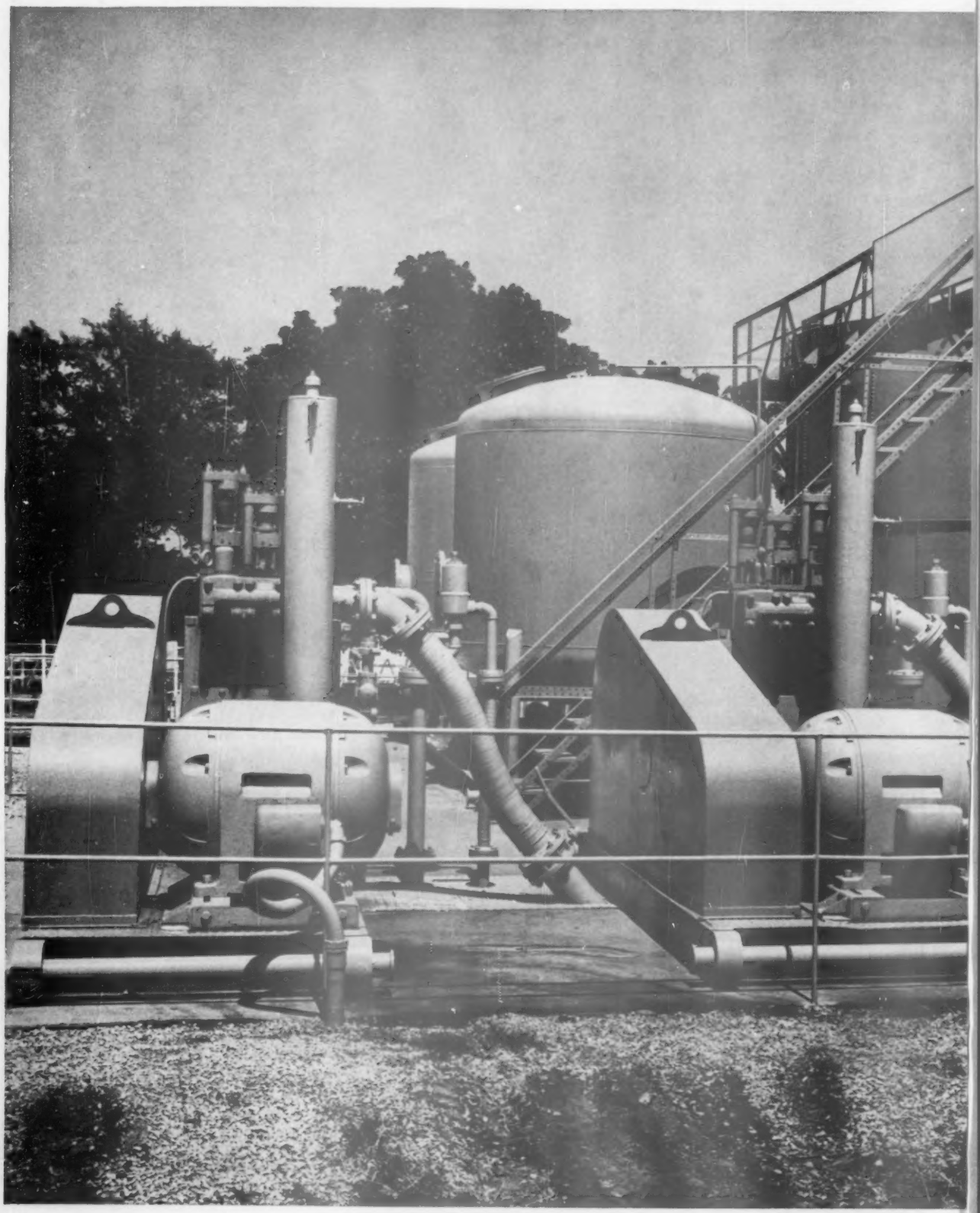
GENERAL AMERICAN
TRANSPORTATION CORPORATION

LOWER WATER-FLOOD PROJECT TIME AND COSTS



WITH LOW-COST VICTALITE STP

(low density sodium tripolyphosphate)

Take a moment... jot down a few figures on a typical water-flood project of yours: Recovery rate... injection rate... injection pressure... cost of present stimulation treatment... pump, reducer, meter and pipeline maintenance.

Victalite STP scale inhibitor can improve that picture *right now!*

FASTER

Fast dissolving Victor STP produces a stable solution in fresh water that is simply metered into the injection stream. Its ability to reverse the wettability of the oil-wet system may enable you to log higher injection rates, higher oil displacement rates at a lower well-head pressure. Flooding time and total project costs are reduced.

LOW-COST

Effective at *low* levels of concentration, *Victalite* STP is a most efficient and economical method of stimulation. Not only do injectivity and recovery rates improve, but maintenance costs are reduced as well. Acting as complexing agents for heavy metal ions and other insoluble precipitates, this easily and safely handled material prevents or redissolves plugging scales and precipitates. Result: maintenance costs go down on pumps, meters, reducers and at other pipeline restrictions.

EASY TO USE

Readily available, easy and safe to handle, *Victalite* STP exhibits excellent solubility over a wide range of temperatures and salinity. It is also compatible with most other chemical additives used in water systems.

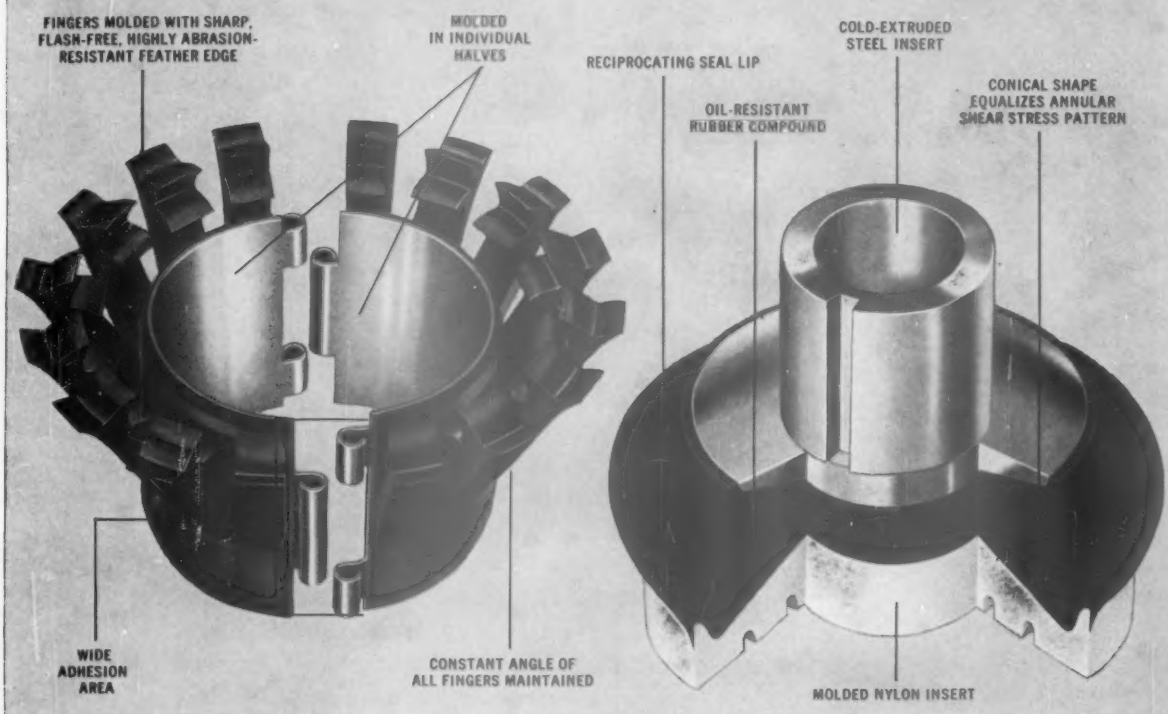
For fast, low-cost acceleration on your water-flood projects contact Victor today. Write, wire or call:

VICTOR Chemicals

VICTOR CHEMICAL WORKS, DIVISION
STAUFFER CHEMICAL COMPANY
155 N. Wacker Drive, Chicago 6, Ill.

OHIO RUBBER

"CUSTOMEERED COMPONENTS BASIC TO INDUSTRY"


FINGERS MOLDED WITH SHARP, FLASH-FREE, HIGHLY ABRASION-RESISTANT FEATHER EDGE
MOLDED IN INDIVIDUAL HALVES
RECIPROCATING SEAL LIP
COLD-EXTRUDED STEEL INSERT
OIL-RESISTANT RUBBER COMPOUND
CONICAL SHAPE EQUALIZES ANNULAR SHEAR STRESS PATTERN
WIDE ADHESION AREA
CONSTANT ANGLE OF ALL FINGERS MAINTAINED
MOLDED NYLON INSERT

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FLEXIBLE COUPLING—"customeered" to a specific rate of torsional shear. **Problem Solved:** Bonding of tough rubber compound to greatly dissimilar materials—steel and nylon. Reliable manufacture in bulk by OHIO RUBBER called for special handling of materials, rigid temperature control, building and maintenance of custom-designed compression molds.

"Direct from factory" service on rubber parts!

OHIO RUBBER IS YOUR GOOD SOURCE for quality oil field parts precision-made from rubber or rubber-like materials. And, the rubber industry's newest, most modern plant (190,000 square feet) at Fort Smith, Arkansas is ready to serve you "direct from factory"—to offer full research and development facilities, experienced rubber engineering, cost-cutting production methods and the best in technical field service. We'd be glad to hear from you—call us today!

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PE-41

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Cleanliness of this magnitude reveals the slightest imperfection. The construction of these expansion joints which glisten like diamonds is revealed as not just good, but perfect; one slip could bring disaster.

When special designs and/or services with quality workmanship and dependability are required... call on Adsco.

ADSCO EXPANSION JOINTS BEING SCRUPULOUSLY CLEANED BEFORE OPERATION

ADSCO DIVISION

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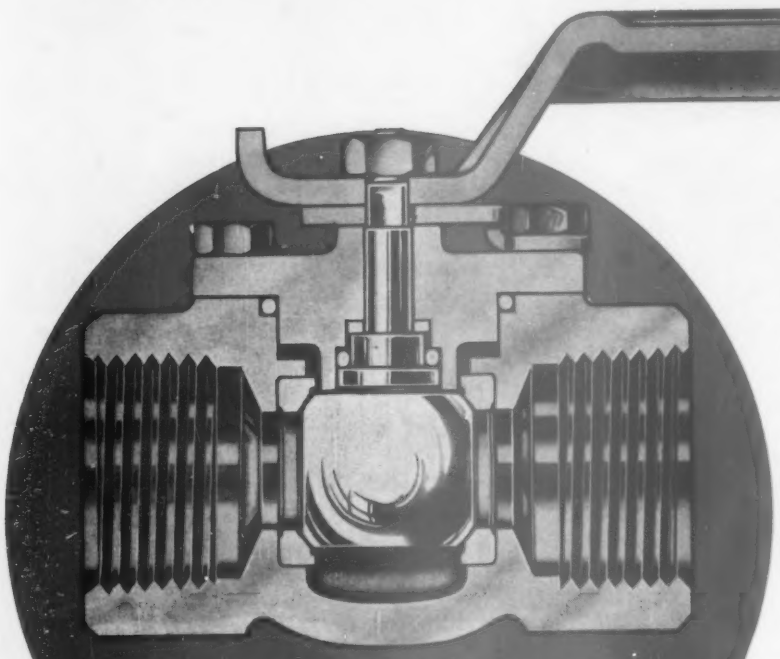
YUBA

YUBA CONSOLIDATED INDUSTRIES, INC.

NEW LUNKENHEIMER STAINLESS STEEL BALL VALVE



Figs. 704-T and 704-B—TYPE 316 STAINLESS STEEL—SIZES ¼" to 2"
TEFLON OR BUNA-N SEATS AND SEALS

- TOP ENTRY FOR EASY IN-LINE MAINTENANCE
- QUARTER-TURN OPERATION
- SELF-ALIGNING BALL
- STRAIGHT-THROUGH FLOW
- COMPACT DESIGN
- LOW OPERATING TORQUE

PRECISION PERFORMANCE IN CORROSIVE SERVICE

Now you can have the corrosion-resistance of Type 316 Stainless Steel in the same Lunkenheimer Ball Valve design that is proving so efficient in bronze. Every part, including the Teflon or Buna-N seats, is precision machined to provide leakproof performance in corrosive liquids, gases, and slurries. Corrosive atmospheres are no threat to solid Stainless Steel bodies and bonnets. Recommended for both pressure and vacuum applications.

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Layne knows that an unfailing supply of water is vital, whether it be for municipal, industrial or agricultural use. With Associate Companies located throughout the world, Layne can provide the speed, the trained technicians and the quality parts to remedy your water problem. Over 75 years of experience accounts for the ever increasing list of customers who depend on Layne for service. For service night and day, call the Man From Layne.

Write for Layne Service Bulletin 100.

LAYNE OFFERS COMPLETE WATER SERVICE: Initial Surveys • explorations • recommendations, site selection • foundation and soil-sampling • well drilling well casing and screen • pump design, manufacture and installation • construction of water systems • maintenance and service • chemical treatment of water wells water treatment—all backed by Layne Research. Layne services do not replace, but coordinate with the services of consulting, plant and city engineers.

LAYNE & BOWLER, INC., MEMPHIS

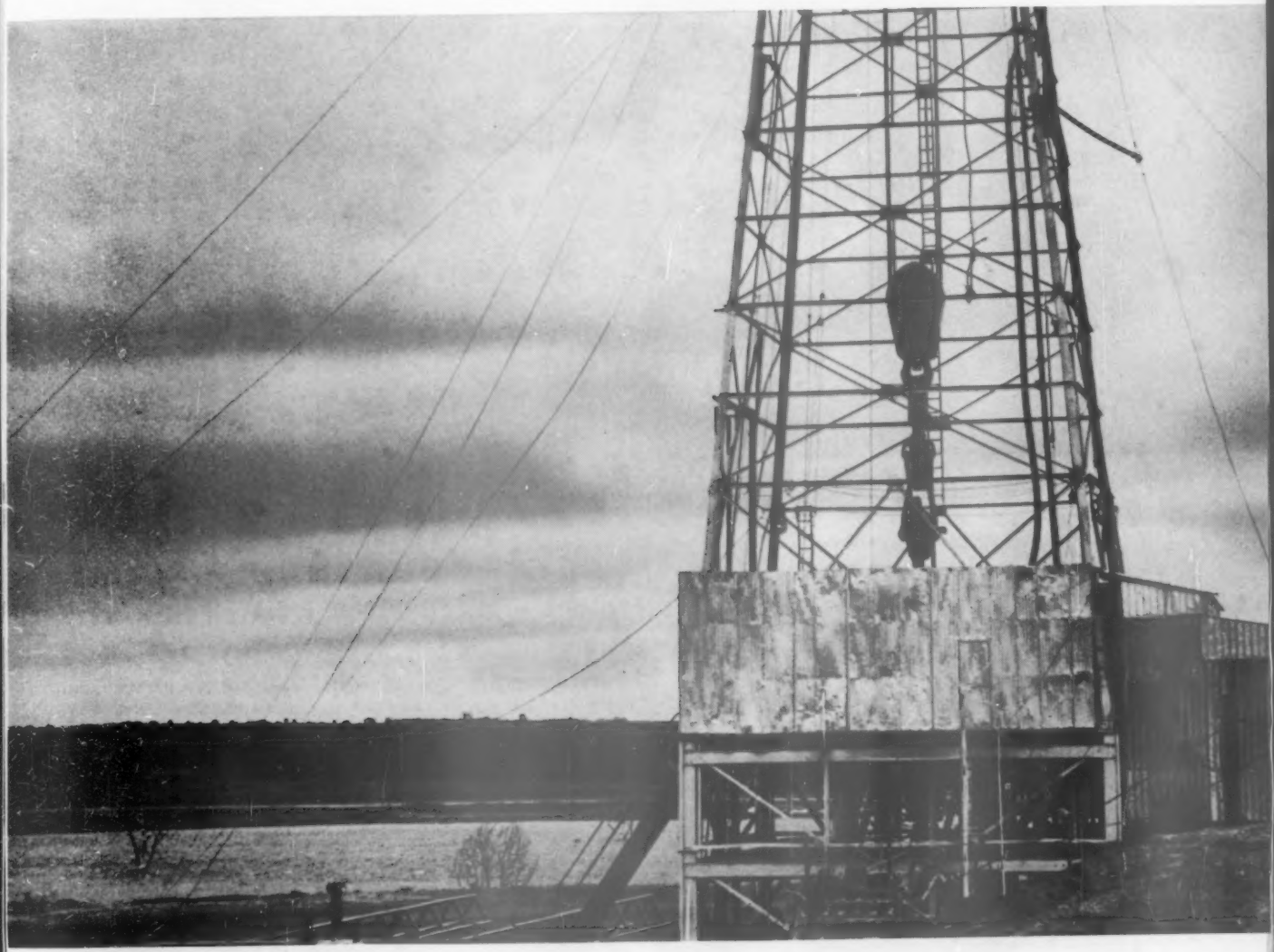
General Offices and Factory, Memphis 8, Tenn.

LAYNE ASSOCIATE COMPANIES THROUGHOUT THE WORLD

SALES REPRESENTATIVES IN MAJOR CITIES

TIGER ON THE SPOT AT HELMERICH & PAYNE, INC.

"We've used USS Tiger Brand Wire Rope



for 40 years—and our men still prefer it!"

Says Lee Daniel, Vice President in charge of operations

Helmerich & Payne, Inc., Tulsa, Oklahoma own some 34 rigs . . . and most of them are equipped with Tiger Brand wire lines. Mr. Daniel says, "We have tried many lines and our boys in the field would rather have USS Tiger Brand than any other line. We're looking for over-all efficiency and we're getting it. Tiger Brand gives consistently good service. The American Tiger Brand Sales Engineer is always on the job when we need special service. We've learned the various cut-off practices that are best—that really work. We keep good ton-mile records and pay attention to them when purchasing wire rope. That's why we've used Tiger Brand for 40 years."

Rig No. 44, shown here, was drilling to 16,000 feet near Chickasha, Grady County, Oklahoma. It was equipped with 7,500 feet of 1¼" Tiger Brand 6x19 Monitor Preformed Rotary Drilling Line with wire core. The crews had drilled to 15,000 feet in 162 days—*and had no trouble with this line.* They expect to get about 120,000 ton-miles from the line.

Mr. Carl H. Young, assistant to vice president, added this comment, "We would like to keep our maintenance figures as low as we can. Ton-mile records prove that we've made the right choice in Tiger Brand."

For complete information about various USS Tiger Brand lines for oil field service, write for our catalog, **American Steel and Wire, Dept. 1402, Rockefeller Building, Cleveland 13, Ohio,** or contact our nearest distributor.

USS and Tiger Brand are registered trademarks

American Steel and Wire
Division of
United States Steel

USS

Columbia-Geneva Steel Division, San Francisco, Pacific Coast Distributors
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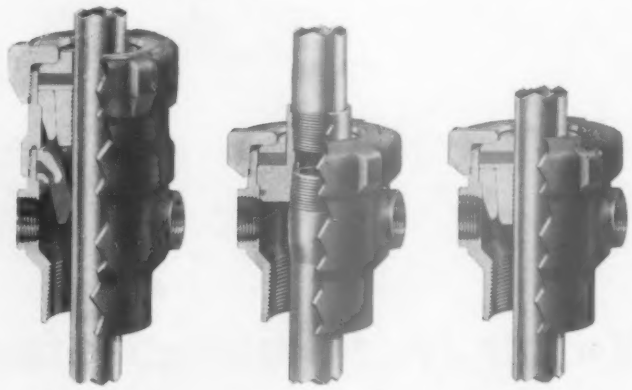
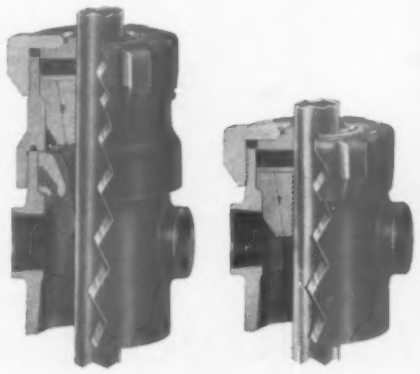
a complete selection for wells

1000 — P. S. I. Working Pressure



TYPE SK TYPE MK TYPE K

2000 — P. S. I. Working Pressure



TYPE SR TYPE R

LARKIN W

2000 — 3000 — P. S. I. Working Pressure

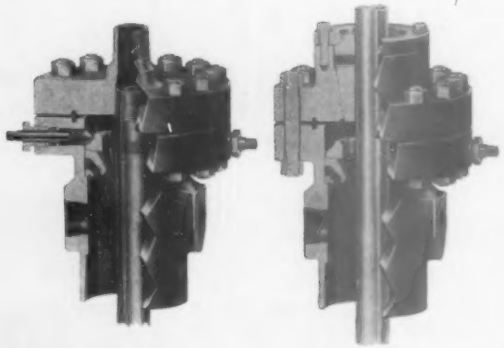
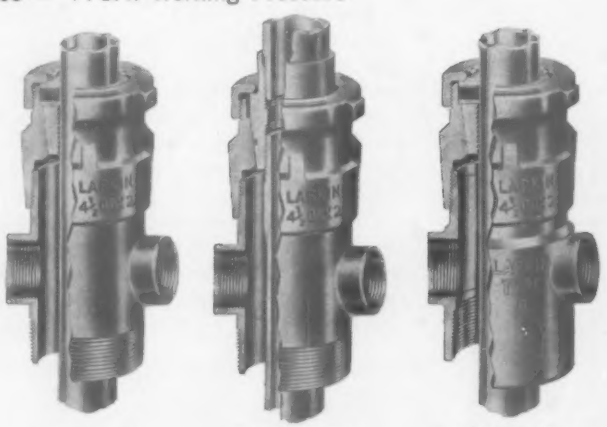


FIG. 612 MANDREL TYPE

FIG. 612 SLIP TYPE

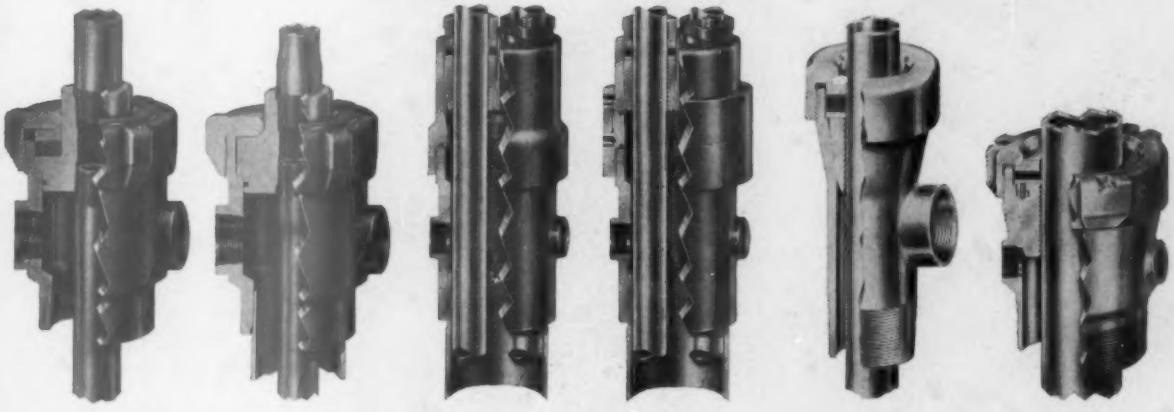
500 — P. S. I. Working Pressure



TYPE H TYPE MH TYPE Q

LARKIN LEADERSHIP HAS BEEN EARNED BY YEARS OF DEPE

# of medium depths and pressures



TYPE MR TYPE MOR TYPE D TYPE DS TYPE X FIG. 92

ELL HEADS

PIPE WIPER

TYPE MQ

NDABLE PERFORMANCE

"K" Series (SK, K, MK) — 1000 psi W. P. Tubing Heads designed along the lines of the "R" Series. They also are adaptable to multiple suspension service.

"R" Series — (SR, R, MR, MOR) — Forged steel 2000 psi W. P. Tubing Heads with a record of many years of satisfactory service. All "R" Series Heads may be converted to a stripper type by addition of a Stripper Adapter and Hycar Stripper.

"D" Series (D, DS) — Forged steel 2000 psi W. P. Tubing Heads using the standard "R" Head Body. They are illustrated to show dual completions but have been successfully adapted to additional tubing strings.

"X" — Furnished for 2", 2½" or 3" tubing with male or female bottom connection. Will suspend "macaroni" from ¾" to 1½". Also available with mandrel suspension, Type MX.

Fig. 92 — A 2000 psi W. P. Casing Head with forged steel body. It is a good companion head for "R" and "D" Series. It has been successfully adapted to suspend multiple strings of larger sized tubing.

Fig. 612 — Tubing Heads with flanged bonnet available with mandrel or slip suspension for Series 600 (Fig. 612-6) or Series 900 (Fig. 612-9) service.

"Q" and "H" — Economical Tubing Heads available for use on 2" through 7" casing to suspend ¾" through 4" tubing. The Pipe Wiper will hold pressures within the rating of these Heads.

Call your Larkin representative or write for further particulars.

LARKIN PACKER COMPANY
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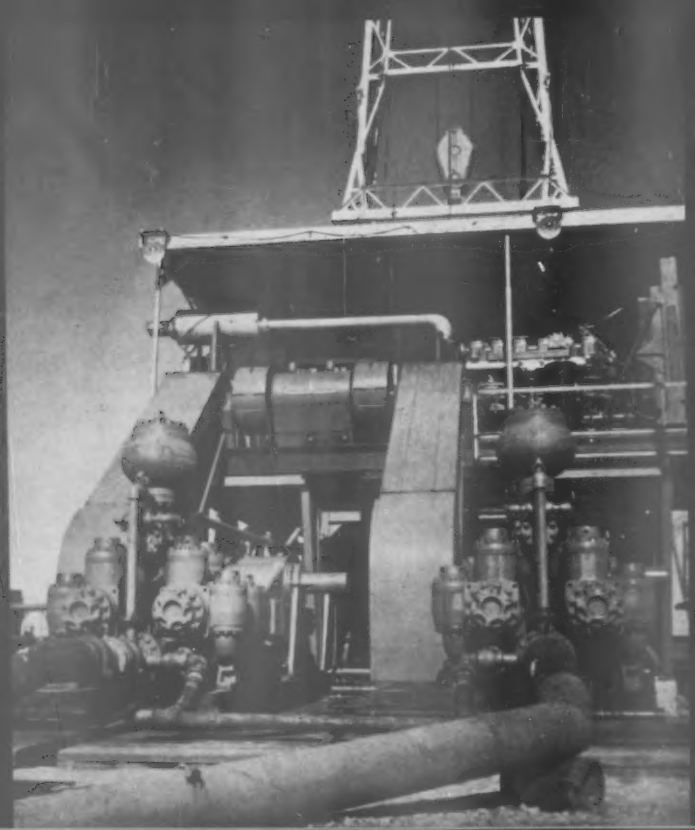
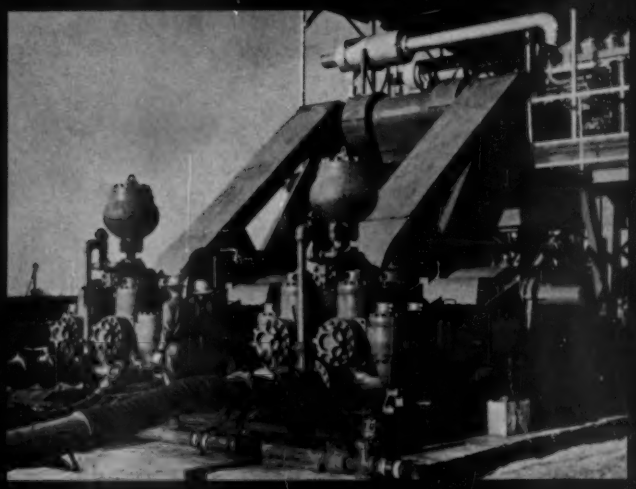
WAXAHACHIE, TEXAS

LARKIN
...Through Your Supply Store

Ask J&L Supply about . . .



J&L SUPPLY



. . . Gardner-Denver pumps
Gardner-Denver parts
Gardner-Denver service

Drilling crews often find their nearest neighbors to be jack rabbits, coyotes and sidewinders. At night their rig lights may be the only sign of human activity for fifty miles.

Dependable equipment is essential. So more and more drilling contractors have standardized on Gardner-Denver mud pumps.

When service is required, the Gardner-Denver pump can generally be repaired in the field with parts quickly available from a local J&L Supply store.

And it's wise to insist on genuine Gardner-Denver parts to put a pump in like-new condition.

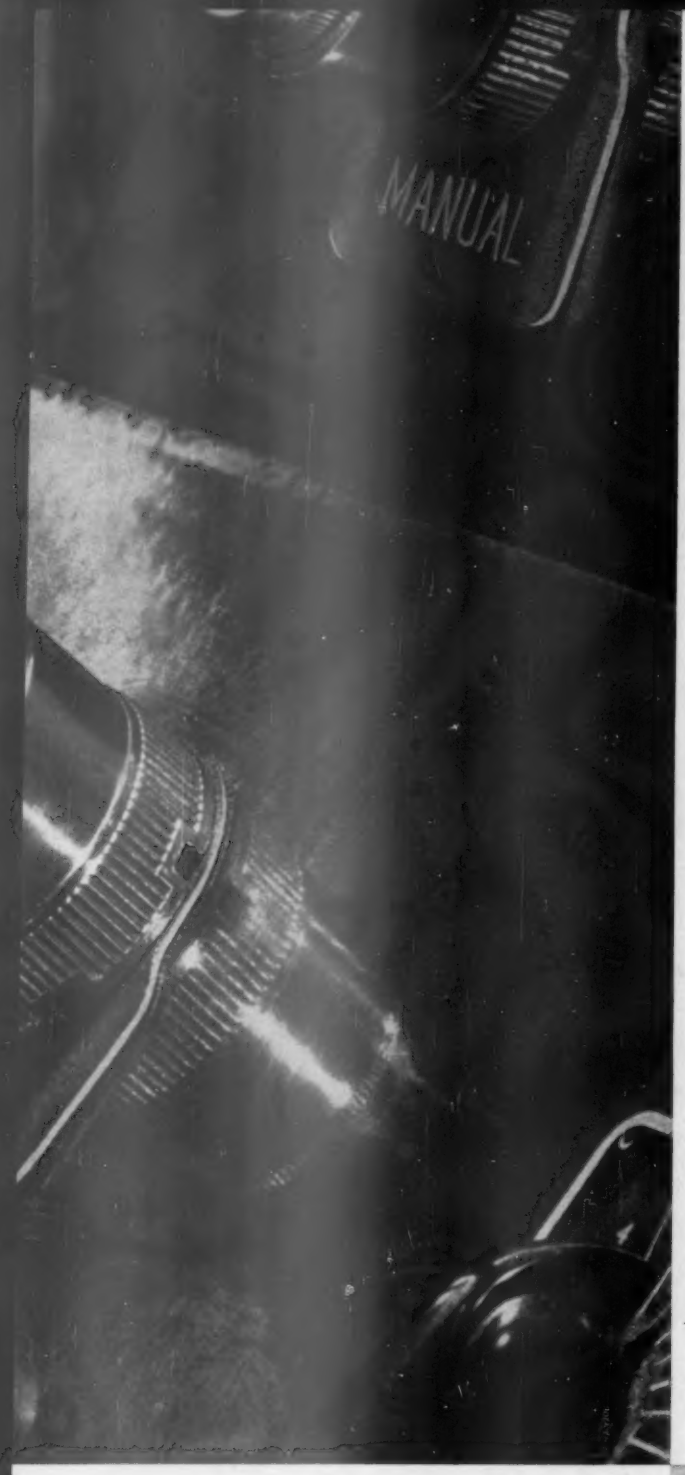
Complete information on any Gardner-Denver pump is available from your local J&L Supply man, or from our Tulsa office, 1437 South Sheridan Road, Tulsa.

Jones & Laughlin Supply Division « Tulsa

W-K-M
DIVISION

ACF INDUSTRIES

Houston, Texas



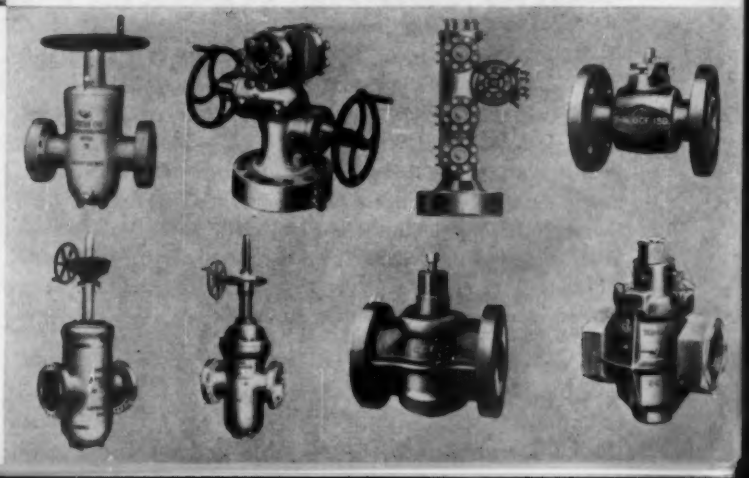
A CREATIVE TOUCH BEYOND "JUST THE NECESSARY" GOES INTO EVERY W-K-M VALVE

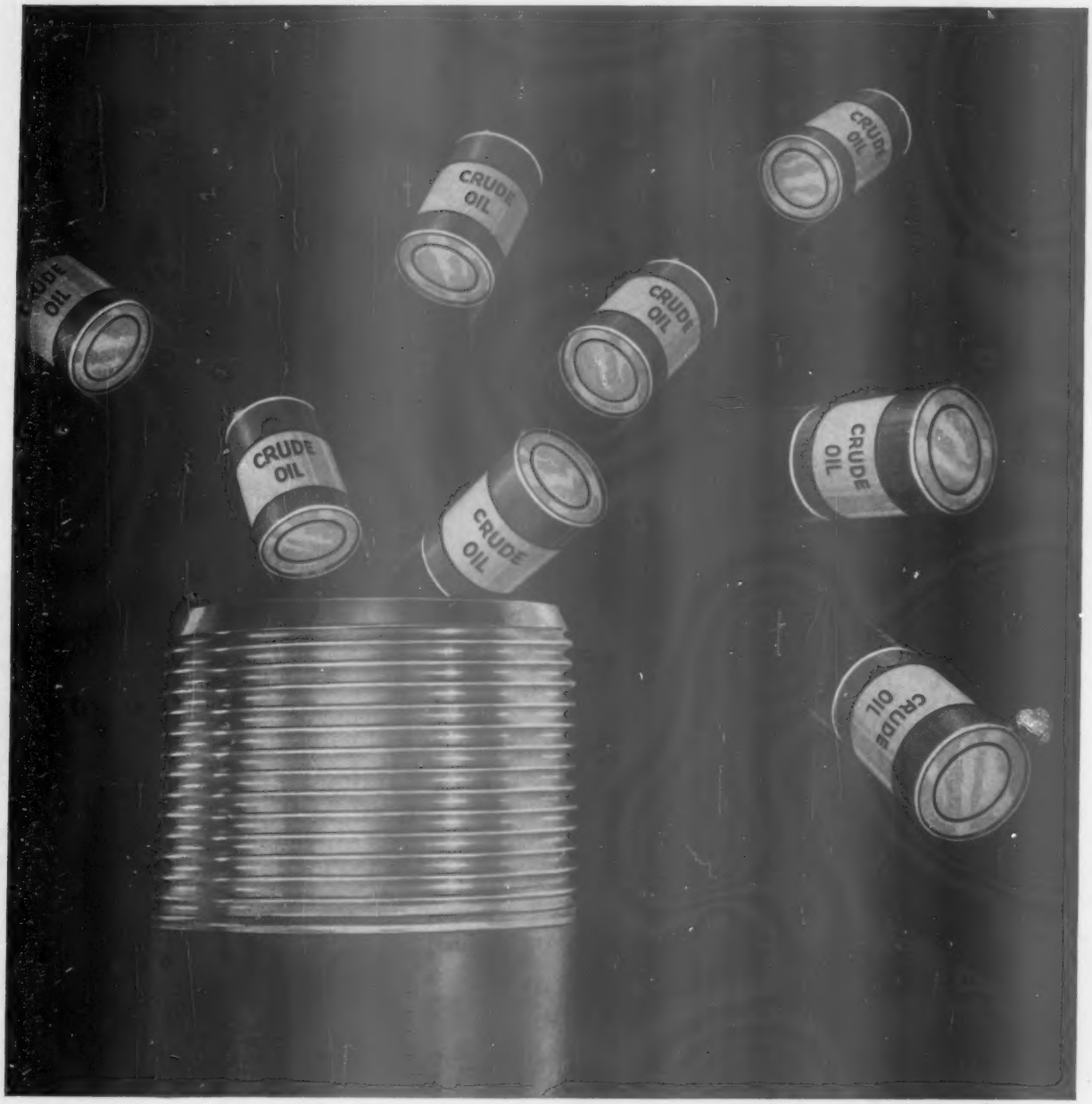
Take the way that W-K-M tool engineers found to gain uniformly higher accuracies in valve manufacturing. They designed and built a complex, new transfer machine that could do the job. An electronic brain guides it in precision machining eight gate-valve bodies simultaneously . . . milling, turning, boring, drilling and threading, self-gauging each operation to insure an unparalleled degree of uniformity.

This is just one example of the many continuing efforts by W-K-M engineers to go beyond "just the necessary" to bring you the best possible valves through highly creative approaches to difficult engineering and manufacturing problems. And who benefits from W-K-M's creativity in action? You do . . . of course.

When So Much Depends On a Valve

. . . *Specify* W-K-M





If crude came up in cans, casing and tubing wouldn't matter

But nature doesn't package her products. She requires you to wrench crude oil from the earth and carry it to the surface in tough steel arteries.

No tubular products handle this load better than CF&I Seamless Casing and Tubing. This top-quality steel pipe has the *straightness* that takes the kinks out of production problems . . . the *precision threads* and *strong joints* that prevent leakage and withstand high internal and external pressure. In addition, you can count on the quality *customer service* for which CF&I has long been noted.

CF&I Casing and Tubing meets API STD 5A specification and is available in sizes 2⅜" through 9⅝" O.D. Call your nearby CF&I sales office for complete details and speedy delivery.

The Colorado Fuel and Iron Corporation
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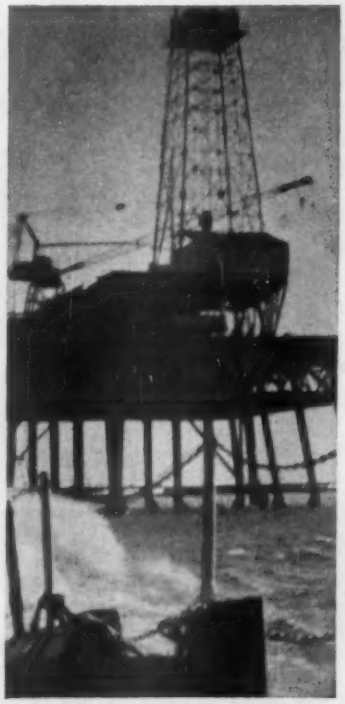
CASCADE—First diesel-electric drilling rig operating in Canada.

EXETER—First dual power generator assignment providing variable-constant engine speed control.

SLATS HONEYMON—First dual power output with independent speed control for mud pump and rotary.

HELMERICH & PAYNE First 2-speed draw works; driven by gear motors.

DIXIE—First electric drilling rig package for rotary table operation only.



CALDRILL—First diesel-electric powered drilling rig operating on an offshore California platform.

Progressive Contractors DRILL ELECTRICALLY

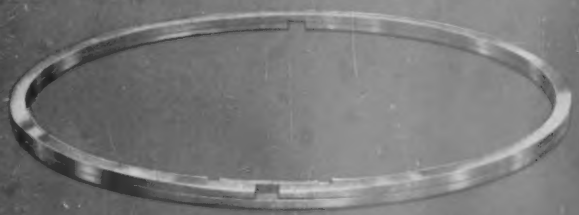
Installations confirm . . . up to 52% savings in maintenance costs, 75% less downtime from transmission difficulties, 35% reduction in transportation and rig-up time, 15% savings on fuel, and higher efficiency results in faster over-all drilling.

For new rigs or repowering existing ones, General Electric's engineers can help you select and apply the right electric drive for your needs, to improve your competitive position, increase flexibility and maximize rig life and operating profits. Write Oil Well Drilling, Section F102-01, Building 3-42, General Electric Company, Erie, Pennsylvania, for further information.

Progress Is Our Most Important Product

GENERAL ELECTRIC

COOK PLAIN RING, TYPE 101 — This is the basic one-piece compression ring made of Cook's Graphitic Iron with a 45° angle joint. Proper ring tension — which never wears out is provided by Cook's exclusive knurling process.



COOKTITE SEALING RING, TYPE 109 — Completely seals the ring gap, ring groove, and cylinder wall in both new and worn cylinders. Will increase cylinder life, eliminate compression losses and reduce fuel consumption.

COOK OIL CONTROL RING, TYPE 303-DCX — Will conform to shape of cylinder whether surface is true or out of round. Features lifetime coil spring. Most copied oil control ring in the world.

TYPE 301-1X — This is a double-acting full sealing ring that is actuated by a coil spring and has complete flexibility to assure perfect cylinder contact even in worn cylinders.

COOK SEGMENTAL RING, TYPE 104 — Consists of three or more outer segments with step-cut joints actuated by a flat inner steel expander. Provides efficient seal on both cylinder and groove.

Look to **COOK** *for Better Rings!*

See the complete line in Cook's new PISTON RING CATALOG

Whatever your piston ring requirements — Plain, Full Sealing, Segmented or Oil Wiper — there's a job-engineered Cook ring to fill the bill.

The complete lineup of rings is illustrated and described in Cook's new 16-page piston ring catalog. The catalog also describes the special rings of Cook's Airtomic Division.

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DIVISION OF DOVER CORPORATION

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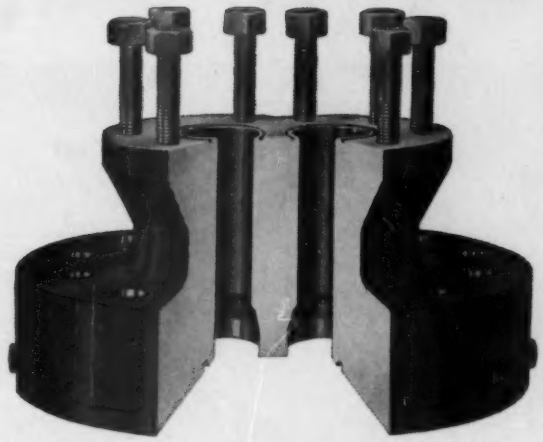
Rector
Multi-String Tubing Heads

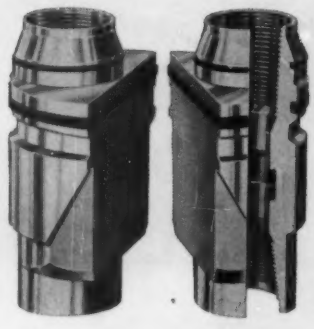
For Maximum Flexibility and Positive Control During All Multiple Completion Operations

From start to finish RECTOR Multi-String Tubing Heads allow full passage of packers and other tools to the oil string. Split hangers are automatically aligned in the head by fixed lugs . . . no guide pin necessary.

Tubing strings are run and landed without removal of blow-out preventers. Positive control of well is maintained by sealing elements on hangers and removable RECTOR-PSI circulating full opening back pressure valves during removal of blow-out preventers and installation of Christmas Tree. A special Rector multi-seal ring on each hanger insures positive steel seal for each tubing string.

Available through your favorite supply store or your Rector representative.





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WELL EQUIPMENT CO., INC.

Making the Oil Industry Safer!

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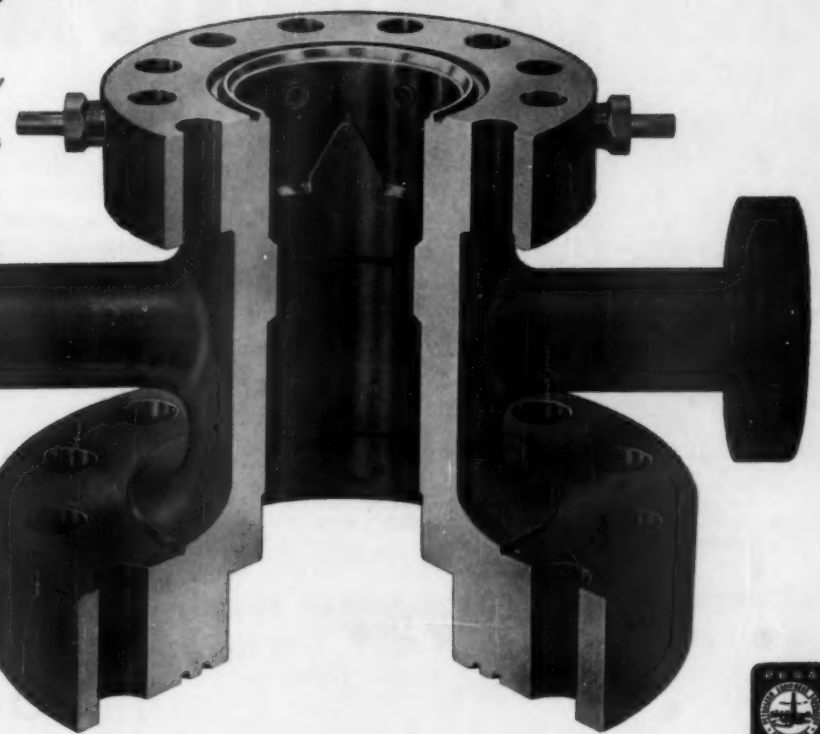
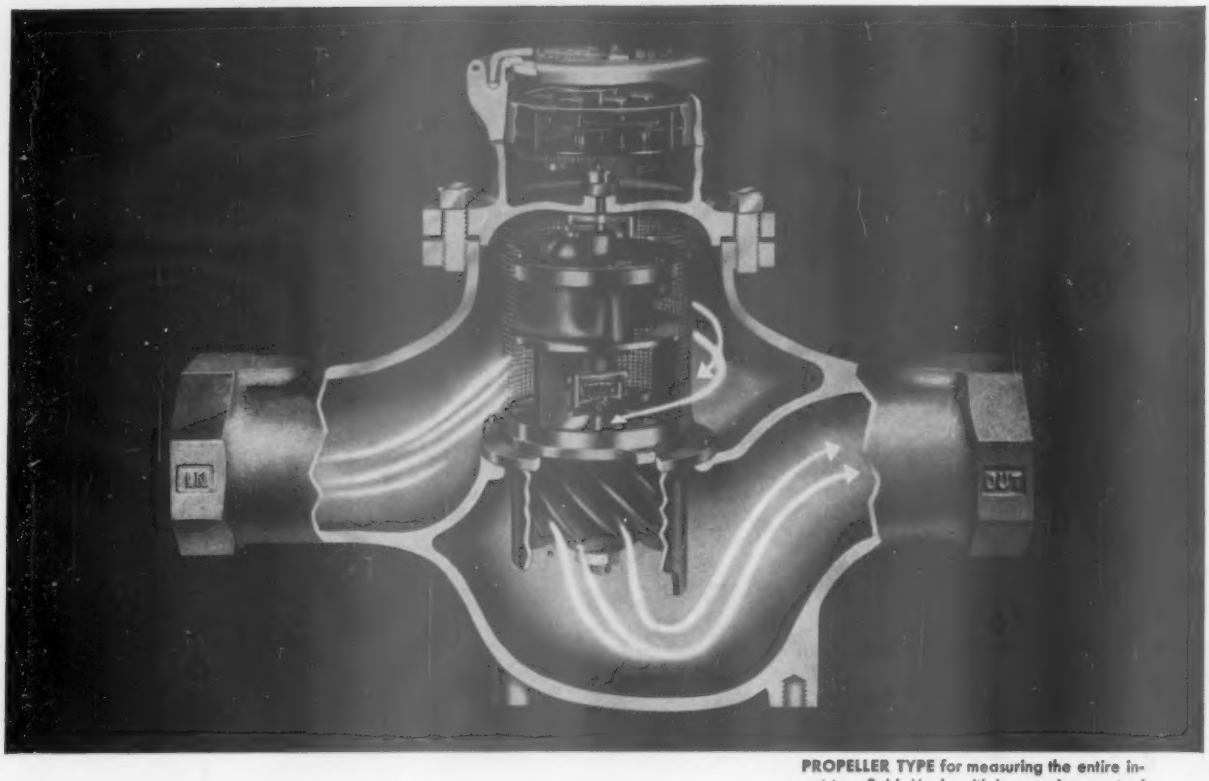
Houston Plant: 2215 Commerce Street



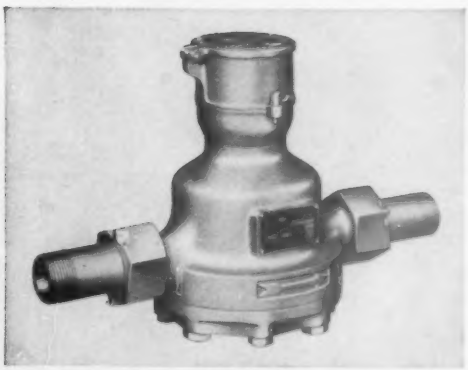
RECTOR DUAL CHRISTMAS TREE

EXPORT REPRESENTATIVES: CONTINENTAL-EMSCO CO., MID-CONTINENT SUPPLY CO., OILWELL DIVISION OF UNITED STATES STEEL CORPORATION



PROPELLER TYPE for measuring the entire input to a field. Made with bronze, iron or steel cases for up to 2500 psi working pressure in sizes 2" to 6".

Why 3 out of 4 secondary recovery systems use ROCKWELL METERS



DISC TYPE for measuring and balancing water input to individual wells. Sturdy bronze case is designed for 2000 psi working pressure. Optional coupling sizes of ½", ¾" or 1" simplify installation.

Over twenty years ago we developed the first successful meter to measure water forced into the ground at spaced flooding points. Now about 75% of all secondary recovery systems use Rockwell meters.

Successive improvements, plus optional materials make today's meters an even better buy. For instance interior parts of either bronze or nickel alloy are optional depending on an analysis of the water.

In both the propeller and disc types, the meter register has a sweep hand with a dial reading to 1/10th barrel per revolution. This permits you to time input rates quickly and accurately.

You can buy Rockwell meters right off the shelf at leading supply stores. Ask for them by name.

Write for free wallet size "Reddi-Rate" setting table to simplify your calculations. Rockwell Manufacturing Company, Dept. 132K, Pittsburgh 8, Pa. In Canada: Rockwell Manufacturing Co. of Canada, Ltd., Box 420, Guelph, Ont.

Buy at Your Supply Store

WATER FLOODING METERS
another fine product by
ROCKWELL

PRECISION MAKES THE DIFFERENCE

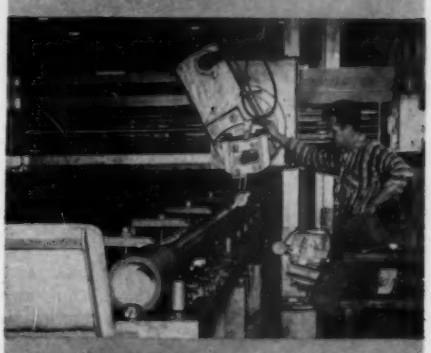
AT AVONDALE OIL TOOLS

Add the know-how of skilled Avondale craftsmen to the finest specialized machine tools in the Gulf South, and you have **precision**—the **big-**difference that keeps your valuable equipment operating at peak efficiency. Avondale Oil Tools is not just one operation—but represents the combined capabilities of the entire Avondale organization—hull and structure repair at the Harvey Yard, machined castings at Service Foundry, new construction and repair at the Main Yard.

Precision, service, capability are at your service at Avondale Oil Tools.

Machining grooves for stainless steel insert in blowout preventer.

Repairing worn hydramatic brake.



Machining Kelly to original dimensions on 40' stroke planer.

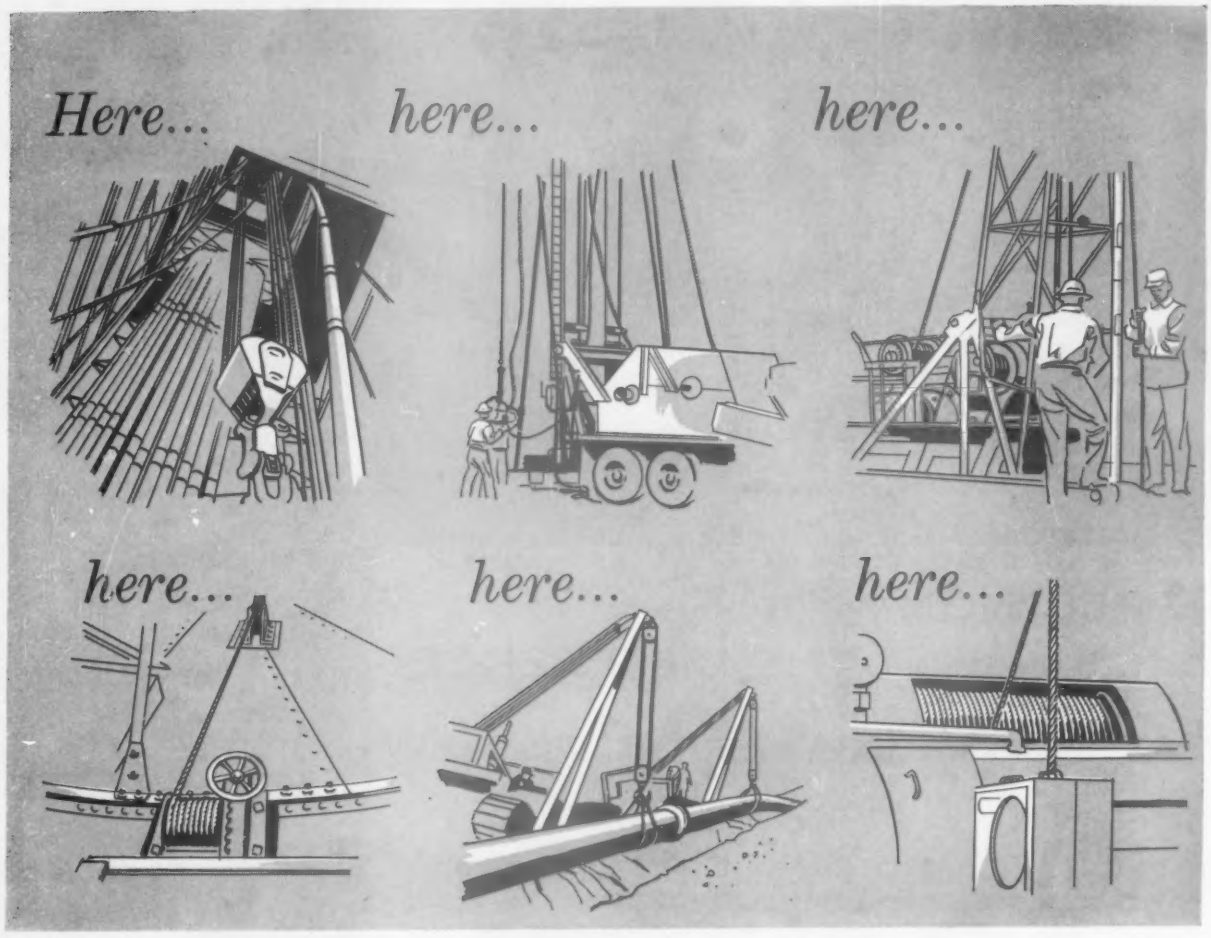
AVONDALE SHIPYARDS, INC.

HARVEY QUICK REPAIR DIVISION

P. O. BOX 116, HARVEY, LOUISIANA • PHONE FIllmore 1-4211

The right Macwhyte

reduces wire-line wear



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MACWHYTE
THE RIGHT MACWHYTE
WIRE ROPE
MADE IN U.S.A.

ROTARY TON-MILE CALCULATOR AVAILABLE FREE—Round trip ton-mile calculator with double slides is of special interest to contractors, drilling superintendents and engineers. Ask any Macwhyte office or distributor for Calculator No. 58101.

Less wire-line wear means less maintenance and replacement

In the right Macwhyte, you get the exact combination of the wearing qualities your equipment demands. Macwhyte has more than 60 years' experience in meeting the needs of the oil patch in...

Rotary Lines	Cable Tool Lines	Sand Lines
Pumping Lines	Core Barrel Lines	Sucker Rod Lines
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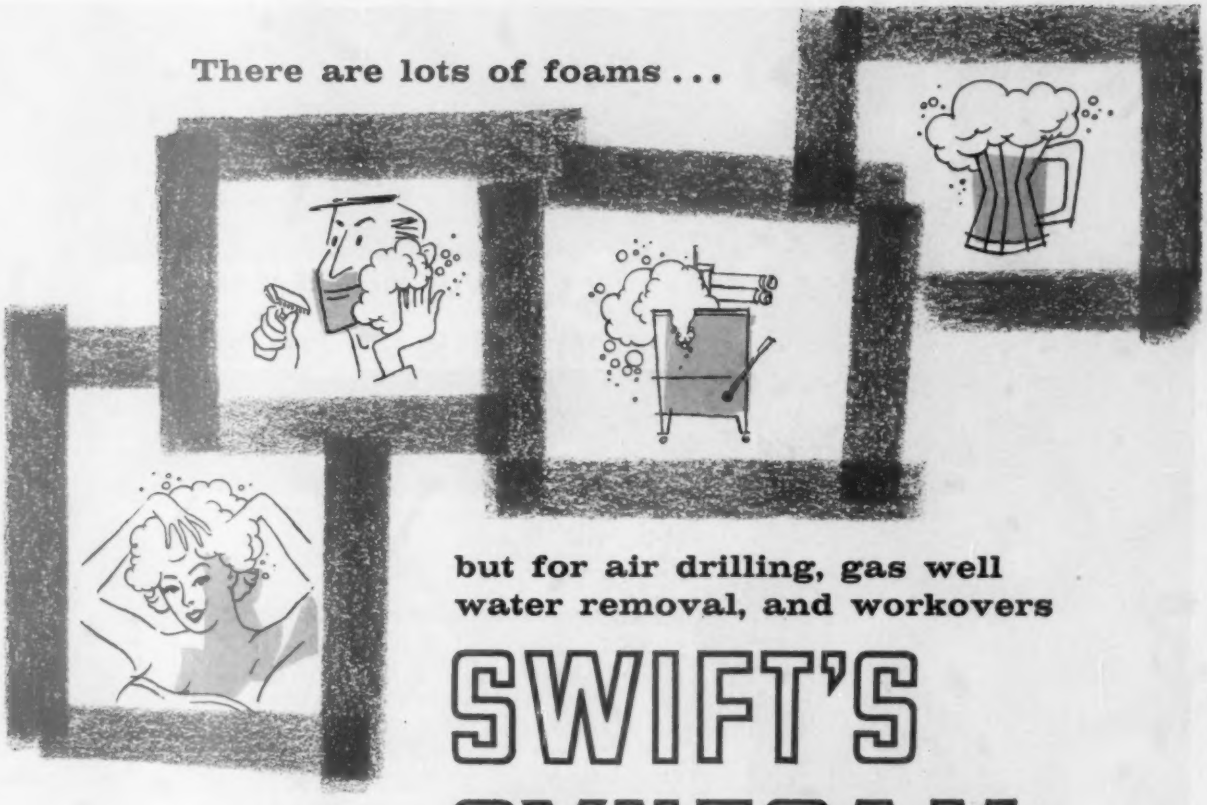
Ask a Macwhyte distributor to recommend the right Macwhyte. Circular 6156 free upon request to Macwhyte Company, 2900 Fourteenth Ave., Kenosha, Wis.

Ask about Macwhyte's new 7-FLEX® wire rope

MACWHYTE Wire Rope COMPANY

Wire Rope Manufacturing Specialists Since 1896

There are lots of foams . . .



but for air drilling, gas well water removal, and workovers

SWIFT'S SYNFOAM

gives you these four most important characteristics

1. The ability to remove large volumes of water—optimum bubble thickness and water entrainment.
2. Low adsorption on cuttings for more economical usage. Helps in unloading a hole after losing circulation during trips, etc.
3. The ability to work in the presence of salts of all kinds for greater efficiency under tough conditions.
4. The flexibility and toughness to withstand extreme air velocities encountered when air is the circulating fluid.

Swift's Synfoams have been developed especially for oil field usage with the characteristics *you* need built in. And they are easy and economical to use wherever foam is needed. Ask your Synfoam distributor for full information or write

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FOAMING AGENTS
106TH YEAR
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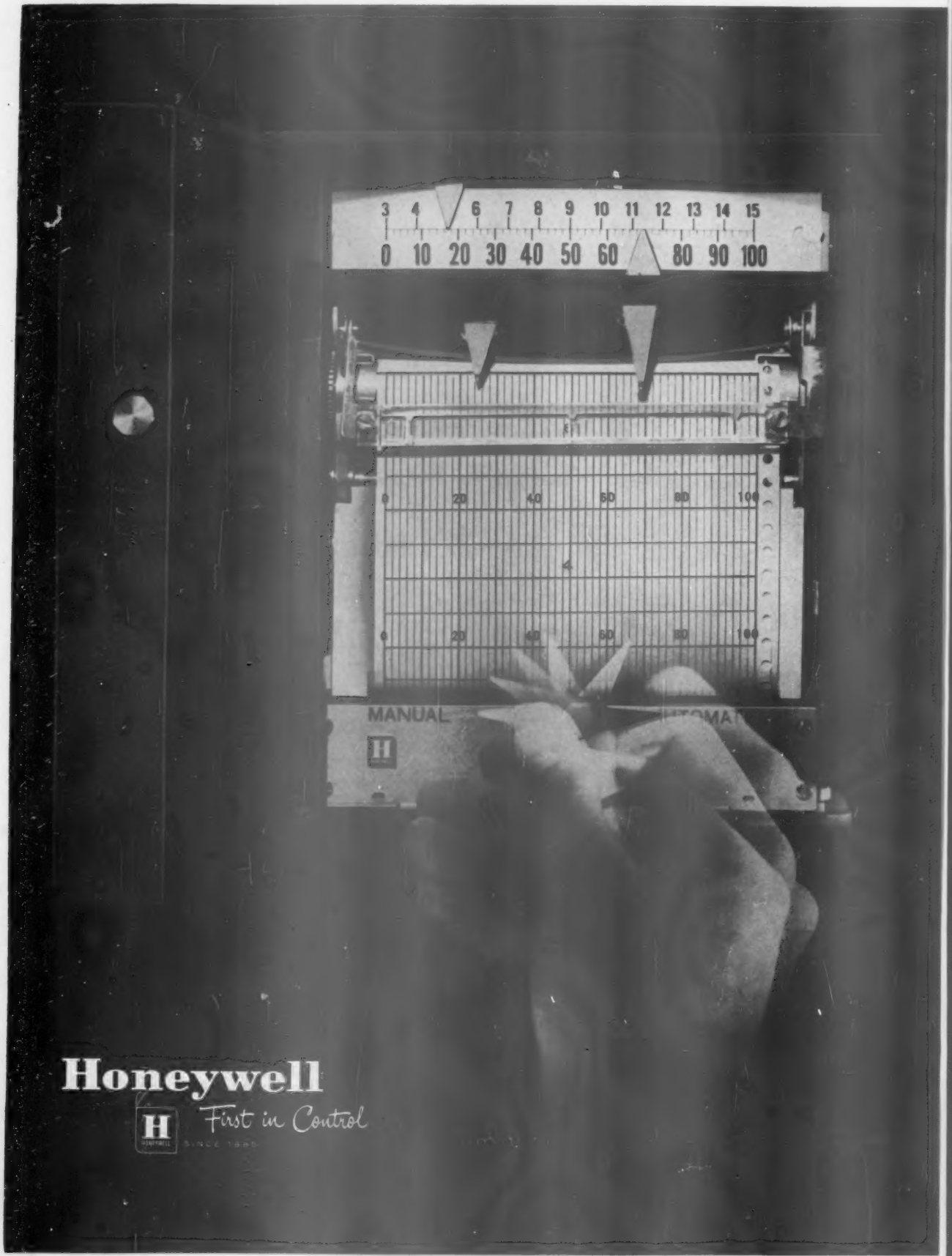
Also available from mud companies.


3 4 6 7 8 9 10 11 12 13 14 15
0 10 20 30 40 50 60 80 90 100
MANUAL
Honeywell
First in Control

Automatic Switching Eliminates Matching of Pressures *with*

New Honeywell PneumatiK Tel-O-Set Instrumentation

Honeywell brings new features, new performance to small case instruments with the introduction of *PneumatiK Tel-O-Set Instrumentation.* Here are just a few of the many new features:

Automatic Switching Just a flip of the control lever switches the instrument from automatic to manual or vice versa. There are no bumps, no delays, no matching of pressures required. This simplified switching makes cascade control systems practical for the operator.

Easily accessible adjustments Zero and damping adjustments to pen can be made while the pen is recording. Effects of adjustments can be seen *while* they are being made. Since it is not necessary to withdraw the recording chassis to make adjustments, there is no possibility of causing a pen zero shift.

Interchangeable chassis and controllers Recording and indicating chassis are interchangeable. Just pull out one chassis and plug in the other. Quick-connect air terminals eliminate the need for tubing connections. Two- and three-mode controllers with backset adjustments are also completely interchangeable.

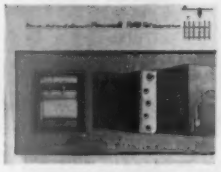
Easy-to-read, easy-to-change 4-inch charts Pen position on the 4-inch chart permits instantaneous reading of variables at all times. Pen arm design also permits rectilinear recording. Front-loading, tilt-out chart drive makes it easy to change chart rolls in a matter of minutes.

All cases fit 6 x 6 cutouts All models fit standard panel cutout of 6″ x 6″. Overall dimensions: 6¾″ wide; 7½″ high; 15¼″ deep.

Calibrated control adjustment Adjustments to controller can be easily made from back of the panel by removing controller cover. Calibrated dials for each adjustment ensure precise setting of proportional band, reset and rate values. Optional front-set control adjustments make it easy to set control from front of panel.

Easy to remove components To remove any particular component from the case, it is only necessary to loosen a screw or lift a latch.

HANDY DEMONSTRATOR-IN-PRINT Get the full story on new Honeywell *PneumatiK Tel-O-Set* Instrumentation by writing for this handy demonstration-in-print. This booklet covers in words and pictures all the important installation, operation and maintenance features of the new line. It will help you evaluate the many advantages *PneumatiK Tel-O-Set* holds for your process. Send for it today. MINNEAPOLIS-HONEYWELL, 4405 Wayne Avenue, Philadelphia 44, Pa. In Canada, Honeywell Controls, Ltd., Toronto 17, Ontario.



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Keep jobs moving with THERMOID Big T

HOSE FOR DRILLING & PRODUCTION

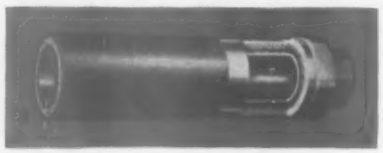
ROTARY HOSE for slim hole and production drilling

1. POWERFLEX GOLD STRIPE. Proof-tested to 7,500 lbs. pressure for safe operation at any pump pressure, with plenty of reserve strength to prevent blow-outs. Extra-heavy abrasion-resistant cover. Sizes 2½" to 4".

2. TRIOFLEX. Cover of tough, oil and grease resistant synthetic rubber. Wire braid reinforced. Proof-tested to 2000 lbs. Unusual flexibility and resistance to kinking permits coiling in 36" coil. Lengths of 25' to 50'. Sizes 2"-3".

BLOWOUT PREVENTER HOSE for all pressure operated units

3. Wire braid construction and special pressed on couplings provide more than ample safety margin for handling any pressure found in operating blowout preventer equipment. In 1" 2-braid or 1¼" 3-braid.



SLUSH PUMP SUCTION HOSE for heavy duty pumping

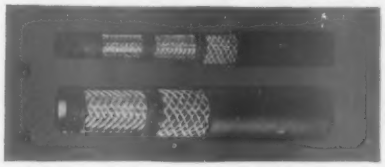
4. MUDFLO. Thick inner tube firmly bonded to a strong, open-weave breaker fabric. Heavy galvanized round wire reinforcement prevents collapse, affords maximum flexibility, absorbs pumping vibration and provides unobstructed flow. Sizes 4" to 12".

HOSE FOR GENERAL PURPOSE USE

STEAM HOSE

5. SUPER-IRONSIDES. Designed for extra heavy duty with 388°F. steam at 200 lbs. pressure. Kink-proof and flexible. Steel braid reinforced. Lengths to 50' in ½" to 2" sizes.

6. IRONSIDES. Handles 366°F. steam at 150 lbs. pressure. Braided steel wire construction with steel wire braid reinforcement imbedded in heat-chemical resistant synthetic rubber. Lengths to 50' in ⅜" to 1" sizes.

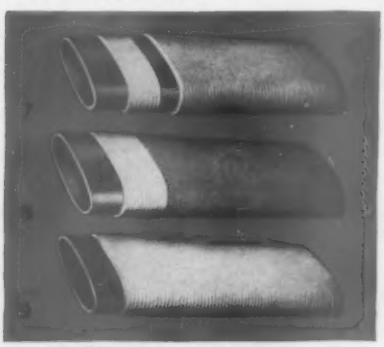


FIRE HOSE

7. PORTER D. J. DELUXE. Double-jacketed 100% synthetic hose designed specifically to resist mildew and rot . . . can be repacked wet, ready for immediate use. First bonded all-polyester fiber double jacket. Test pressure 600 psi. Lengths to 50'. Size 1½"-2½".

8. PETROCHEM. First hose designed specifically for oil and chemical industries. It is 100% polyester fiber jacketed for high pressure service under oily and abrasive conditions. Resists heat to 300°F. Sizes 1" to 2½".

9. SUPER-QUAFLEX. All-neoprene tube is completely oil resistant. Lightweight, flexible and easy to handle. Will not kink and can be recoiled with a minimum of effort. Factory Mutual approved. In 1½" and 2½" sizes; 50', 75' and 100' lengths.



YOUR THERMOID BIG T DISTRIBUTOR HAS A COMPLETE LINE OF RELATED INDUSTRIAL PRODUCTS . . .
including Thermoid multiple V-belts, brake blocks, brake linings, clutch facings, clutch friction discs and gear tooth facings.

Hose

Thermoid hose withstands the most rugged operating conditions in the petroleum field . . . keeps production on schedule by reducing down-time to an absolute minimum. Your Thermoid Big T distributor can quickly supply the specific hose you need to fill any application in the petroleum field. For information, write Thermoid Division, 200 Whitehead Road, Trenton 6, New Jersey, or phone JUniper 7-3000.

Quaker Thermoid

HOSE FOR PETROLEUM DELIVERY

FLOATER HOSE
for offshore delivery

10. 100% synthetic construction for maximum resistance to salt water, petroleum based products and extreme temperatures. "D" rings spaced along hose for attaching inflatable Thermoid pontoons. Hose is available in continuous lengths in sizes 3" to 10" and in working pressures of 130 to 200 psi. Pontoons are 100% synthetic construction with nylon cord reinforcement.

SUBMARINE HOSE
for ship to shore delivery

VICTOR. Toughest construction of any hose made. Has long life in spite of the most rugged operating conditions in the industry. Flexibility meets tanker motions easily. Withstands working pressures of 250 lbs. Has built-in heavy-duty steel nipples and welded steel flanges. In 25' lengths, 12" size.

SUCTION AND DISCHARGE HOSE
for oil and gasoline

11. **POWERFLEX.** Designed for conveying aromatic solvents. Guaranteed for 2000 hours of service. In sizes 3" through 12".

12. **EBONITE.** Multiple plies of strong, closely woven heavy-duty duck, frictioned with high grade rubber compounds for firm bonding and high burst resistance. Lengths to 50'; sizes 3" to 12". (Also available in "Quaflex" grade with nylon cord reinforcement.)

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H. K. PORTER COMPANY, INC.
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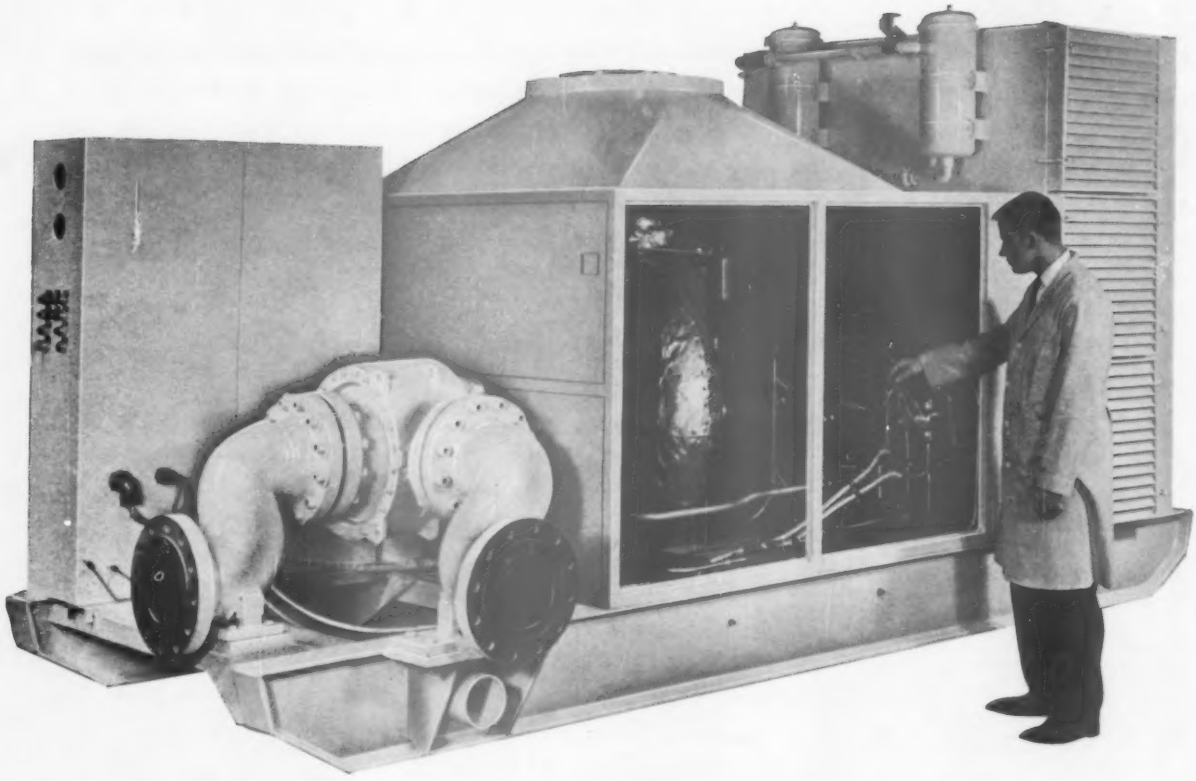
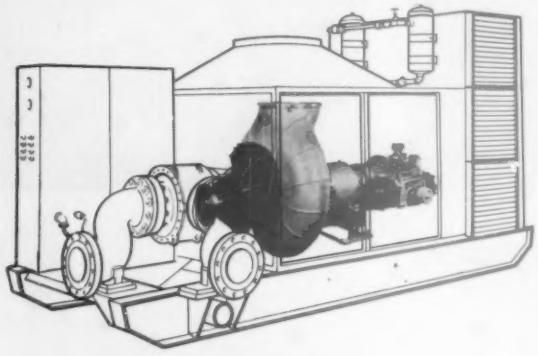


Solar gas turbine pumps provide compact, portable power in a wide variety of applications

Solar 1100 hp *Saturn* gas turbines are ideally suited for driving industrial pumps. Lightweight and compact, they are used in applications ranging from field boosting to a truck-mounted oil well fracturing unit.

Solar *Saturn* gas turbine-driven pumps are easily moved from job to job as requirements change. They can run on virtually any kind of fuel, including gasoline, diesel fuel, kerosene, natural gas and LPG fuels.

The *Saturn* engine is operating or scheduled for a number of pump jobs.



Phillips Pipeline Company has a *Saturn* gas turbine-driven pump at its El Dorado, Kansas, station. It provides up to 1900 gallons of liquefied products per minute at 2500 ft of head. This *Saturn* turbine-driven pump runs automatically on natural gas from the line on a continuous duty basis. It weighs just 7800 lbs. Comparable piston-driven units weigh between 50,000 and 75,000 lbs.

Mid-America Pipeline Company will use a *Saturn* turbine pump to increase propane capacity at the company's booster station near Whiting, Iowa. The unit is skid-mounted and will run on propane fuel taken from the pipeline.

Okan Pipeline Company has a *Saturn* gas turbine to drive a booster pump in its main pipeline, which carries liquid petroleum products. The *Saturn* gas turbine runs on liquid butane most of the time but is capable of running on other refined liquid fuels.

The Western Company has a *Saturn* gas turbine-driven fracturing pump designed to stimulate production of older oil wells. Mounted on a commercial bobtailed truck, the *Saturn* turbine-powered pump delivers 1000 hydraulic hp per unit over a wide range of volume-pressure ratios. Weight of the truck and fracturing unit is 15,000 lbs lighter than 600 hp diesel units used by Western, allowing for increased mobility

Solar gas turbines start instantly in any climate and accept full load without warmup. The *Saturn* gas turbine is vibration free and requires no elaborate foundation. Simplified design assures easy, low cost installation and maintenance.

For further information write Solar, Dept. J-154, San Diego 12, California.

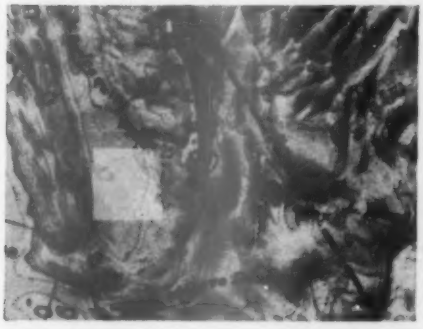
SOLAR

A subsidiary of International Harvester Company

A "do-it-yourself" scale remover

HAGAN WELL CLEANER C-2

Hagan Well Cleaner is a 100% active, solid mixture especially designed for the removal of calcium carbonate "gyp" scale. Easy to handle, the cleaner, when dissolved in water, removes even heavy deposits of scale in 3 to 4 hours. It will clean producing wells, filters, heat treaters, pumps and lines. Check *your* scale problem against these actual operator experiences:



1 A group of wells in the San Joaquin Valley producing an average of 9 BOPD and 50 BWPD were being batch treated to prevent the formation of scale. The treatment was reasonably effective, but was too costly. The operator, working with a Hagan engineer, decided to use Hagan C-2. A charge was put down the annulus of one well to dissolve what scale had formed on the gas anchor, the pump, in the tubing and on the rods. Production increased from 9 BOPD to 19 BOPD with a definite increase in gas as well. After cleaning, continuous treatment with Hagan Controlled Solubility Phosphate was initiated to keep scale from forming again. The operator was so well pleased with the increase in production and the reduction in overall costs that the same treatment has been applied to all his wells.

2 In east central Kansas, an operator with eight wells producing a total of 62 BOPD and 45 BWPD had a scale problem that was becoming troublesome. He decided to test Hagan Well Cleaner C-2 in two of the wells, one of which (No. 3) was not pumping properly. It was decided to leave the pump in the hole on No. 3 as a check. Even without circulation, when the pump from No. 3 was pulled, there was no evidence of scale or corrosion on the rods, tubing, pump or standing valve. Total production, with only two wells cleaned, went to 70 BOPD with the same amount of produced water. Since the treatment was far more effective, and far less expensive, than the results and cost of shooting and fracturing another well on the same lease, the operator is standardizing on C-2 for all his wells.

3 A major oil company had a problem well in northeastern Colorado. The well was producing 9 BOPD, a rate which indicated a scale problem to the operator. A charge of 300 pounds of Hagan Well Cleaner C-2 was mixed with nine barrels of water and poured down the annulus. The well was shut in overnight to allow the Cleaner to work. Production increased to 27 BOPD, or triple the former rate. This operator is convinced the Hagan Well Cleaner really does a job.

For information on how Hagan Well Cleaner can help you, write or phone the address below.

HAGAN—Your only complete source of chemical feeding equipment, water treatment chemicals, field laboratories, engineering service.

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CONTINUOUS LEADERSHIP — CAMERON FLEX-SEAL VALVES

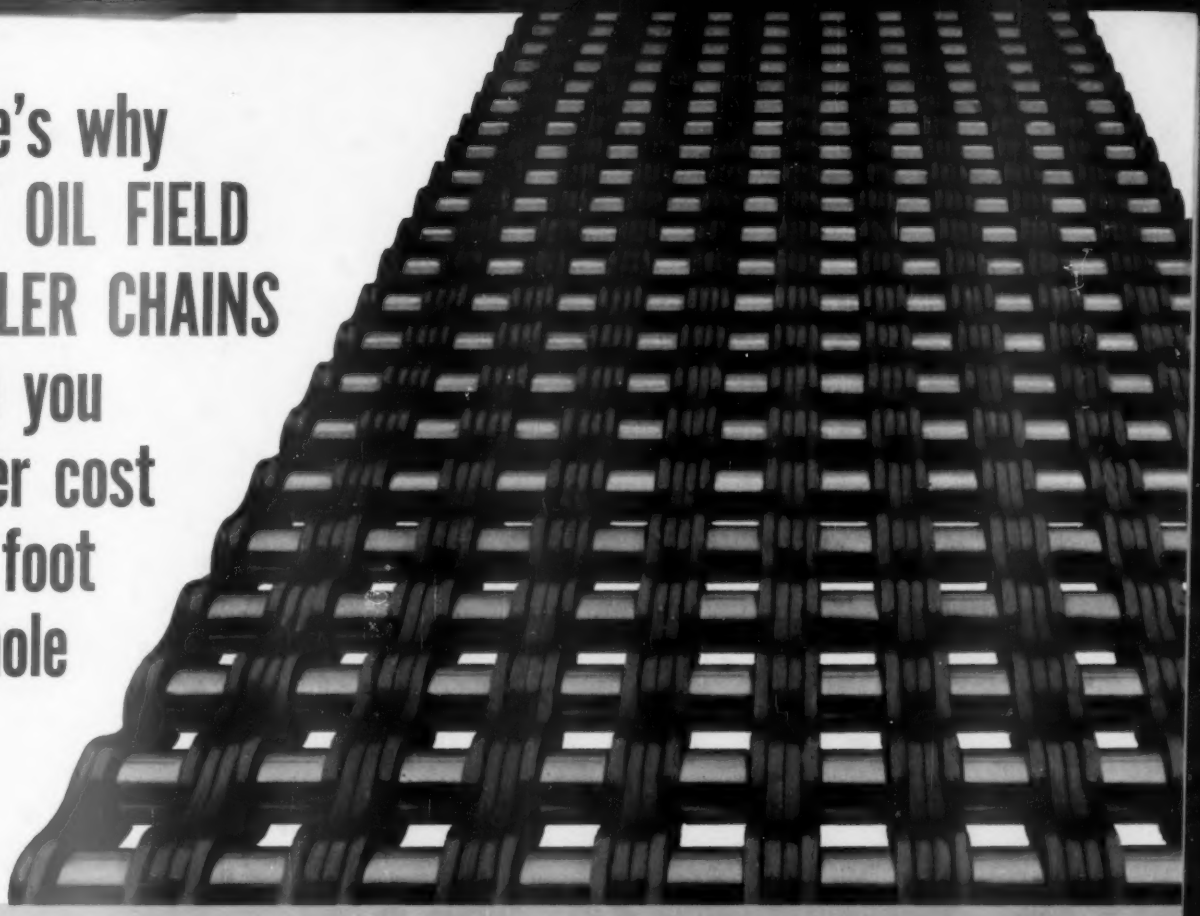
Introduced twenty-one years ago, Cameron Flex-Seal Valves outsell competitive valves year after year for the tough job of handling abrasive fluids at high pressures. For the control of drilling mud, for valve manifolds in well cementing and formation fracturing, operators choose Cameron Flex-Seal Valves for dependability and low maintenance cost.

Examine the improved Cameron Type "R" Flex-Seal Valve and you will see why it is first choice of the field men. Any field man can replace worn parts without removing the valve from the line. A ball bearing reduces the torque for opening and closing. The resilient gate packing is tough and of generous size to insure tight shut-offs time after time, even after considerable wear. The position of the stem shows whether open or closed and in the closed position the amount of reserve packing rubber is indicated.

Choose Cameron Flex-Seal Valves to tame your abrasive liquids.

CAMERON FLEX-SEAL VALVES

Here's why REX OIL FIELD ROLLER CHAINS give you lower cost per foot of hole

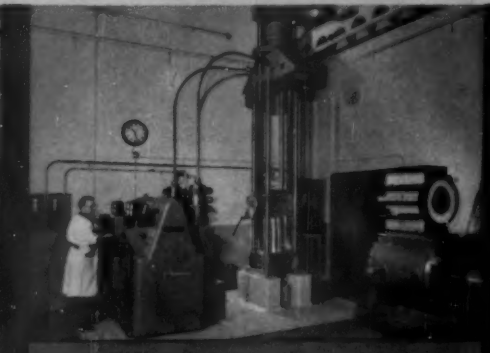


You can be *sure* of longest possible chain life . . . less down time . . . lowest cost per foot of hole drilled . . . with Rex Roller Chains. Here's why:

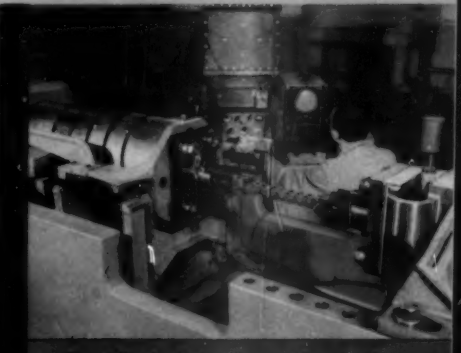
The many life-adding features of these chains were developed, tested and proved in the world's most modern chain laboratory . . . equipped with facilities that are unmatched in the chain industry. These facilities permit Rex Engineers to gather the widest possible range of chain design and application data . . . to discover, test and *prove* new design features that give you the chain operating life you want, and need, for most economical drilling.

For longer-life, lowest-cost chain operation on your rigs, specify Rex.

This "torture" machine enables Rex Engineers to test all working parts of a chain for dynamic loading . . . crams a lifetime of service into a relatively few hours.



This 100-ton fatigue testing machine has 50% greater capacity than any similar device in the chain industry . . . gives CHAIN Belt the capability of conducting the broadest range of stress endurance studies.



Specialized electronic recording equipment is used in both laboratoy studies and on actual chains operating in the field to provide important data enabling CHAIN Belt to build added life into Rex Roller Chains.

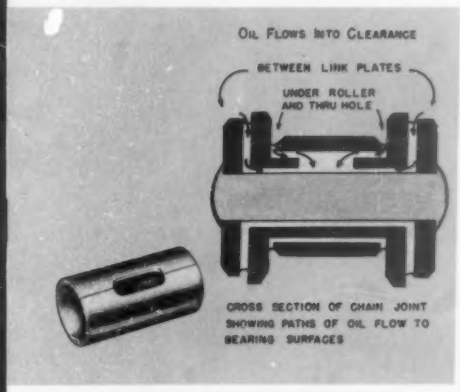
REX®

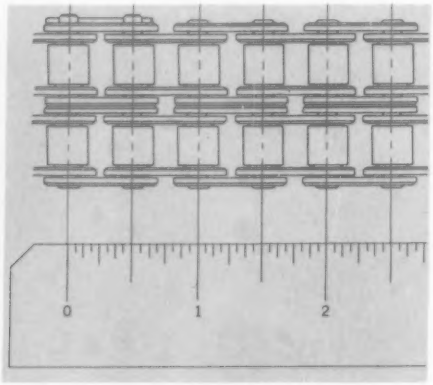
CHAIN BELT COMPANY

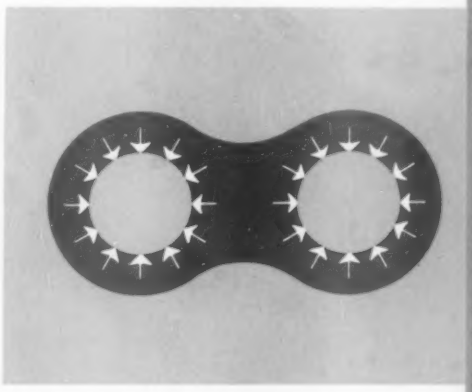
OIL FIELD ROLLER CHAINS

BEST BY ANY USER TEST

THESE EXTRA FEATURES MEAN EXTRA LIFE IN REX OIL FIELD ROLLER CHAINS


OIL FLOWS INTO CLEARANCE
BETWEEN LINK PLATES
UNDER ROLLER
AND THRU HOLE
CROSS SECTION OF CHAIN JOINT SHOWING PATHS OF OIL FLOW TO BEARING SURFACES





OIL HOLE BUSHINGS

Oil holes in Rex Bushings mean easy penetration of lubricant to chain working parts, prolonging chain life by cushioning shocks and preventing galling of pins and bushings.

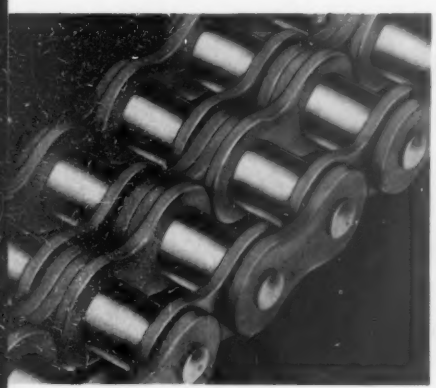
PITCH CONTROL

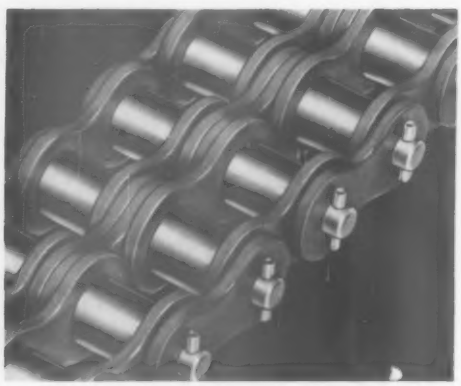
Accurate control of pitch of every link in the strand means every chain part takes its full share of the working load . . . longer chain life because loads are not concentrated on a few parts to cause early failure.

FATIGUE-FIGHTING LINK PLATES

Precise manufacturing plus accurate control of hole location and size, together with built-in beneficial stresses, assures link plates that resist fatigue failures.

THE RIGHT CHAIN FOR EVERY OIL FIELD SERVICE





REX DRIVE-FIT

Best for Extremely High Speeds and Heavy Loads

For these severe operating conditions, Rex DRIVE-FIT Chains are recommended. The pins in these chains are a *drive-fit* in both outer and inner pin link plates to assure maximum holding power and longest possible chain life. Special "tap-fit" connecting link in each chain facilitates coupling and uncoupling.

REX GLIDE-FIT

Where Maximum Ease of Coupling and Uncoupling Is Required

For convenience in coupling and uncoupling, together with long service life, always order Rex GLIDE-FIT Roller Chains. Pins are a "glide-fit" through specially designed inner pin link plates. It is only necessary to drive the pin the thickness of a single link plate to couple or uncouple the chain. These chains give longer life than other roller chains of the "slip-fit" type.

Write for your copy of Oil Field Catalog No. 6116. CHAIN Belt Company, 4683 W. Greenfield Ave., Milwaukee 1, Wis. In Canada, write Rex Chainbelt (Canada) Ltd., Toronto and Montreal.

AVAILABLE AT THESE AUTHORIZED SUPPLY STORES

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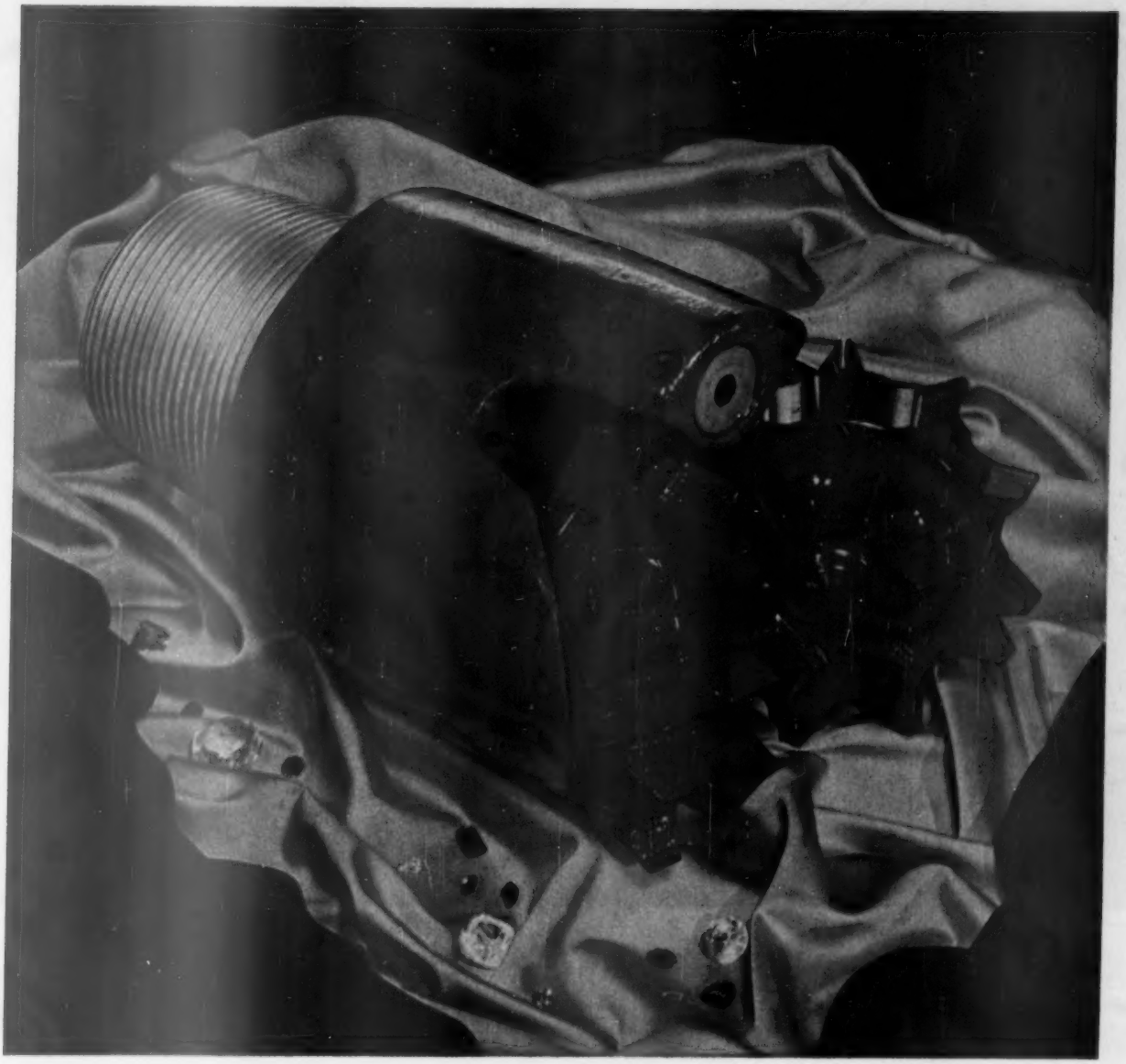
REX®

CHAIN BELT COMPANY

OIL FIELD ROLLER CHAINS

BEST BY ANY USER TEST

LITHO IN USA D&J-61



A SECURITY FIRST! New Extended Jet 2-Cutter Bit

Nothing drills like the new Security Extended Jet . . . because *there's not another bit like it!* This Security-First in 2-cutter bit design is setting new standards of superior performance. In formations of high drillability where added cleaning of bottom hole is vital, the new 2½" closer-to-bottom jet gives extra penetration speed. Less downtime and more accuracy are assured for straight hole and specialized directional drilling!

Call or write today for complete information and size availabilities on this revolutionary Security FIRST!

Security®

ENGINEERING DIVISION
P. O. Box 13647
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ONE OF THE DRESSER INDUSTRIES

Inventory Management Simulator program at...

Clark Equipment... improves customer

High-capacity memory. Two IBM 305 Data Processing Systems with RAMAC keep track of 75,000 replacement and repair parts in Clark's Chicago parts warehouse. **The computer has the facts.** As soon as shipments arrive at the warehouse, an operator, using this remote inquiry station near the loading platform, finds out from the computers where various items go. **Customer service first.** Using this remote inquiry station in the sales department, the operator gets information from the computer while the customer is on the phone.

Clark Equipment Company has prepared a computer program called an Inventory Management Simulator. The program allows Clark management to study the possible effects of decisions on future customer service and future warehouse profitability. When management gets the computer's report, it is in a position to make new rules for the operation of its parts warehouse.

Here's what's happened since Clark put the new program into operation:... improved customer service... practically eliminated back-order problem . . . reduced the putaway time for incoming material by more than 50 per cent . . . reduced emergency order shipping time by 50 per cent . . . enabled a physical inventory to be taken without any interruption of service to customers.

service...with less inventory

Availability highest ever. Inventory management is a complex job at Clark. Its Chicago warehouse is one of the busiest and largest in the country. Before the Simulator program was developed, the warehouse carried an inventory of 85,000 individual replacement and repair parts. Use of the program helped transfer the investment in inventory to those parts most frequently called for, giving high availability with less investment.

Management Operating System.* Clark installed two IBM 305 Data Processing Systems with RAMAC.® These computers store, update, and offer on an instant's notice information on almost every aspect of the warehouse operation including complete information on every one of the 75,000 items maintained in stock.

Now, Clark is assured of maintaining just the right level of stock for each item. The procurement formulas, developed from the Inventory Management Simulator, even recommend how large a purchase order should be placed for each item and where it should be placed.

If you have an inventory problem, why not consider a simulation program? You don't have to have your own computer. We can supply you with an Inventory Management Simulator...you can rent time on a computer. Result...improve the profitability of your warehouse operation.

**A Management Operating System uses IBM computers to make routine business decisions and take action automatically ...flags problems that need management's special attention... frees management to concentrate on the big problems and on long range planning. As a result, it gives tighter control of all business operations...and helps cut costs.*

IBM®
DATA PROCESSING

Better Production Tools Through Research

OTIS Equipment NEWS

Volume III, Number 4 Otis Engineering Corporation • Dallas *Production Equipment and Services*

New Low Pressure Pilot System Offers Simplified Multi-Point Protection In Surface Safety Valve Installations

DALLAS—Two new Otis Pilots have been developed that make possible a well safety system that includes: (1) Multi-point protection utilizing a low pressure control line and (2) Single point, single step resetting to place the entire system back in service after a shut-in. The two new pilots are the Type N Otis Actuator Pilot and the Type P Otis Hi-Lo Auto-Reset Pilot. Both can be used with any one of several different Otis Surface Safety Valves.

A Type N and P Otis Pilot System, when combined with the proper Otis Surface Safety Valves, may be installed to protect a single well or a number of wells such as may be located on an offshore platform. The simplest installation is where a low pressure line connects the Type P Pilots at the point where protection is desired and the Type N Pilot on the safety valve. With this type of hook-up pressure changes from the flow line, sales line, heaters, separators, etc. are automatically transmitted from the Type P pilot to the Type N Pilot and Safety Valve.

Evidence of the acceptability of the new Type N and P Otis Low Pressure Pilot System within the various levels of field operating personnel, from superintendents and engineers through pumpers and gaugers, is indicated by the large number of installations made during the short time the equipment has been available.

Application

The application of the Type N and P Otis Pilot System is practically unlimited — from a single well, simple line pressure installation to a complex, multiple well installation that requires a number of protection points for various conditions that could cause serious loss.

Basically the Type N and P Otis Low Pressure Pilot System is designed to monitor pressure increases or decreases at such points in a surface safety installation as line pressure, separator, LTX unit, free water knockout, heat exchanger and other field processing or production equipment. The system may be installed to monitor various other conditions, also, such as liquid levels, high or low temperatures, volume, viscosity, etc. Electrical control of the system — radio, direct wire or microwave — can be added through the use of solenoids and other electrical equipment. A typical installation, in schematic form, is below.

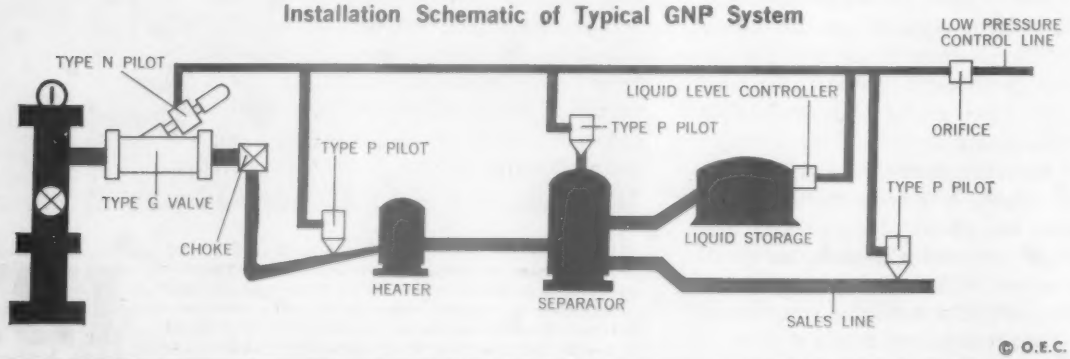
Here are several of the System's Feature Design Principles —

Low Pressure Control Line

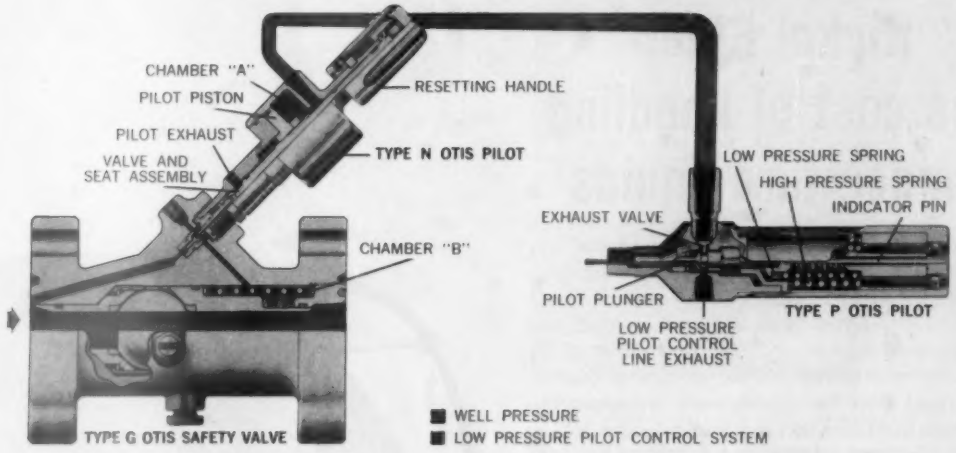
The Type N and P Otis Safety System is designed around the use of a low pressure (usually 30-60 p.s.i.) control line that connects the Type P Monitor Pilots with the Type N Actuator Pilot attached to the safety valve. The use of the low pressure line all but eliminates the possibility of hydrates forming and freezing the line — increasing the reliability of the safety installation. When a shut-in occurs, only one high pressure exhaust takes place . . at the safety valve. Choice of source pressure for the control line is optional — pressure is usually taken from the separator or furnished by bottled gas.

The system, in simplified form, monitors pressure changes through the Type P Otis Hi-Lo Auto-Reset Pilot. Pressure fluctuations beyond the preset limitation of the Type P Pilot cause the pressure on the control line to exhaust. Upon exhaust of the control line pressure, the pressure behind the piston of the Type N Otis Actuator Pilot is removed, allowing the pilot to exhaust a pressure chamber in the safety valve. This action serves to create a pressure differential in the safety valve and permits the line pressure to close the valve.

Installation Schematic of Typical GNP System



Operating Design Principle of Type GNP System



Illustrated as an example of a Type N and P Safety System is the Otis Type G Valve combined with the Type N and P Pilots. This combination of Otis equipment constitutes a safety system suitable for sensing pressure changes from a wide range of remote points. Although the Type G Otis Surface Safety Valve is used for illustration, the pilots may be used with other Otis Surface Safety Valves.

The Type P Pilot serves to monitor pressure fluctuations (within predetermined limits) in the flow line and/or other lines. Pressure variations, either too high or too low, cause the exhaust valve in the Type P Pilot to unseat and release the constant pressure on the connecting low pressure control line. When pressure is released from the control line, the low pressure on top of the piston in the Type N Pilot (Chamber A) is released and the piston moves back, allowing a ball to seat in the bypass of the Type G Valve. With the bypass sealed, pressure from Chamber B in the safety valve is exhausted through the pilot, creating a pressure differential across the ball and flow line pressure may then rotate the ball to the closed position. The entire system may be reopened merely by turning the resetting handle on the Type N Otis Pilot since the Type P Otis Pilot is designed to reopen automatically when pressures return to normal.

Single Point, One Step Reopening

The entire Type N and P Otis Pilot System is designed to be placed back in service after a shut-in by resetting the Type N Otis Pilot on the safety valve. The operation of the system is controlled from this one point . . there are no complicated procedures or detailed resetting instructions to follow. Merely turn the resetting handle on the pilot in as far as it will go and then back it out. The Type N Pilot also may be used to lock a safety valve installation out-of-service with the safety valve in the open position.

Design Principles of The Type N and P Otis Pilots

The adaptability of the Type N and P Low Pressure Pilot System comes from the flexible design principles incorporated into the two pilots . . Type N Otis Actuator Pilot and Type P Otis Hi-Lo Auto-Reset Pilot. As the name implies, the Type N is an actuator pilot for use on Otis Surface Safety Valves. The pilot does not monitor pressure changes, but acts only as a means for closing and opening the safety valve.

Well pressure is exposed to only a small portion of the pilot's valve plunger area. The internal springs, piston and other working parts of the pilot are normally never exposed to well fluids.

The standard Type N Pilot requires manual resetting. It may be modified for automatic resetting. The Type N Pilot is regularly supplied in a 150:1 operating ratio and installation records show a minimum of maintenance.

Type P Otis Hi-Lo Auto-Reset Pilot is a combination high and low pressure sensing device (0 to 10,000 p.s.i. range). It may be installed at any point in a surface safety valve system where protection is desired. The Type P Pilot does not require manual resetting after a shut-in but is designed to reset itself when the pressure it is monitoring moves back into the range of its settings.

A small pin at the rear of the pilot indicates whether the pilot is set and "in-service" or whether it has operated. Pressure from the monitored source enters in only a small portion of the ½" threaded male connection. Fluids that could corrode or damage the internal working assembly do not enter the main body area of the pilot.

For more details on the construction and operation of the pilot, see illustrations above.

Safety Equipment Recommendations

The Type N and P Otis Pilots are excellent examples of Otis' leadership in safety equipment. Experienced and trained Otis Safety Equipment Specialists have the combined knowledge of the company's more than 20 years experience to draw on when making installation recommendations. Whatever your safety equipment requirements, call the Otis office nearest you or write Otis, Dept. E-4, P. O. Box 35206, Dallas 35, Texas. You'll find Otis Safety Valve Specialists ready to help you . . anxious to serve you . . with the widest variety of production equipment and services available today.

OTIS
Engineering OTIS Corporation
General Offices:
8612 Boston Drive • Dallas

USS 9% Nickel Steel reduces cost of handling low-temperature liquids

Today, more than 400 pressure vessels made of 9% nickel steel are providing economical service at temperatures down to −320°F, the boiling point of liquid nitrogen. The pressure vessels shown here are designed for liquid oxygen storage at −297°F. Low carbon, 9% nickel alloy steel was developed to provide a ductile, moderately priced steel for storing such cryogenic liquids as ethylene, methane, oxygen and nitrogen in the temperature range from −150°F to −320°F.

USS 9% Nickel Steel maintains good strength, toughness, and excellent ductility at sub-zero temperatures down to −320°F. At room temperature it has a minimum yield strength of 65,000 psi and high charpy impact values, while at −320°F, double-normalized and tempered 9% nickel steel shows a 36% increase in yield strength, and charpy keyhole impact values range from 20 to 40 ft/lbs. Since tensile properties and impact values are even better for quenched and tempered 9% nickel steel, recognition by various code groups of the suitability of such heat treatment is now being considered.

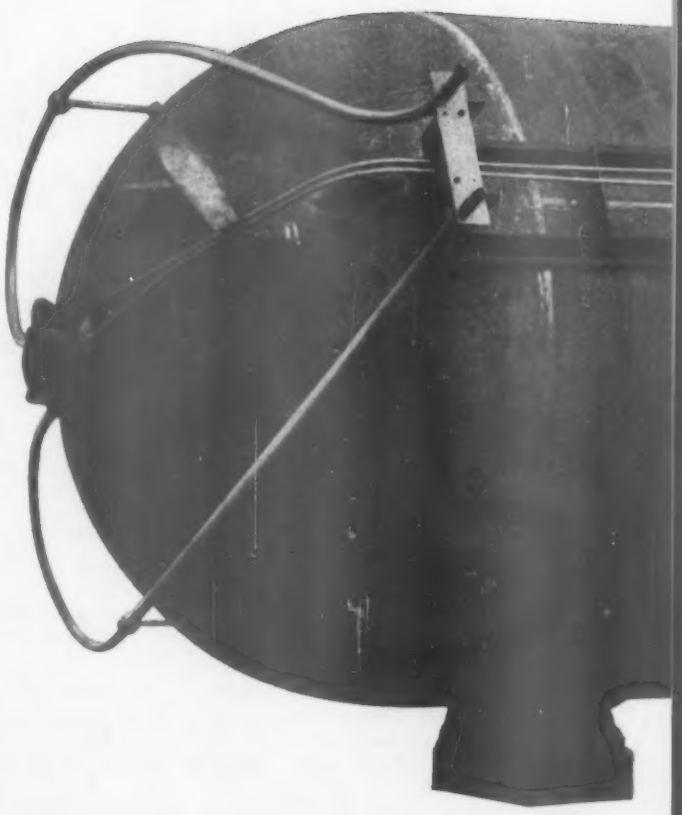
10% lower costs. Accumulated data on cryogenic vessels of 9% nickel steel suggest that minimum savings of 10% of the final erected costs can be expected from reductions in material welding and fabricating costs alone, in comparison with non-ferrous metals. Economies due to higher strength are also possible. An allowable ASME working stress of up to 23,750 psi permits reduction in vessel weight with lower unit costs.

Acceptance of 9% nickel steel in the quenched and tempered as-welded condition by code and regulatory bodies would make this steel even more attractive to designers and fabricators since the vessel would cost less to produce without stress-relieving and would be less expensive to the user.

Results of "Operation Cryogenics." Impact tests conducted late in 1960 on three full-size rectangular vessels refrigerated to −320°F, showed that 9% nickel steel vessels in the as-welded condition (not stress-relieved) could withstand impacts far beyond any likely to occur in service. Burst tests on six cylindrical vessels, also at −320°F, showed that burst pressure for the three as-welded vessels (not stress-relieved) averaged higher than that of the three stress-relieved vessels. Burst pressure for all six vessels was at least four times the design pressure. These tests proved that 9% nickel steel has the high strength, low temperature toughness, and weldability needed for cryogenic pressure vessels.

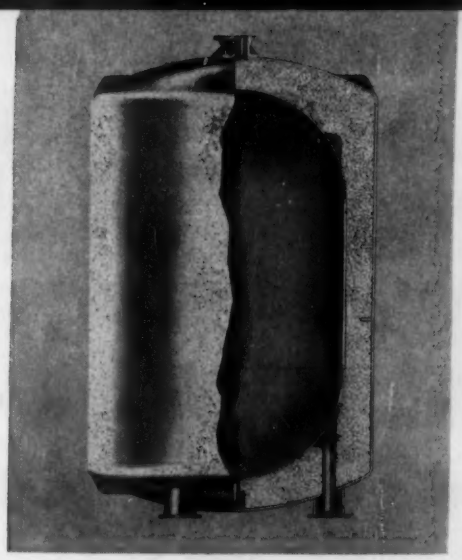
For the complete story of USS 9% Nickel Steel, including all the details of "Operation Cryogenics," write to United States Steel, 525 William Penn Place, Pittsburgh 30, Pennsylvania. USS is a registered trademark.

United States Steel Corporation • Columbia-Geneva Steel Division • National Tube Division • Tennessee Coal and Iron Division • United States Steel Supply Division • United States Steel Export Company



USS

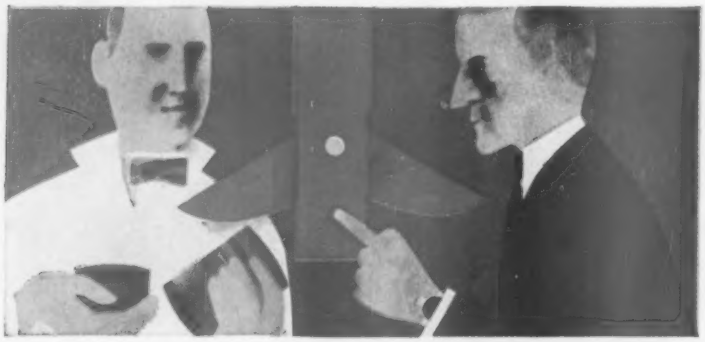
United States Steel



Above, cutaway view shows typical insulated 9% nickel steel pressure vessel nine feet in diameter and 16 feet in over-all length. Outer tank is structural carbon steel. **Left and below,** cylindrical pressure vessels for handling liquid oxygen at —297°F during fabrication from USS 9% Nickel Steel at Pittsburgh-Des Moines Steel Company. Vessels like these will be used by Air Reduction Company, Inc., New York. Each one holds the equivalent of 550,000 standard cubic feet of oxygen gas in liquid form, at a normal design pressure of 270 psi and was stress-relieved after welding in accordance with 1961 ASME regulations. Plate thicknesses are 0.700" in the shell plates and 0.375" and 0.350" in the hemispherical head segments. These vessels are designed and stamped in accordance with the ASME code. Vessel at left is ready to be insulated and inserted in its carbon steel shell, while, below, a welder completes a bottom head.

For maximum strength . . . toughness . . . safety

NEW UNDERGROUND SUPERHIGHWAY



Read how Gulf's Single-Point Entry Technique for fracturing gives up to 100 times the fracture capacity of conventional fracturing... offers you precision placement and increased drainage, too.

GULF

Perhaps you have used hydraulic fracturing successfully. It has helped many oilmen jump well production to 5 and 6 times the usual bbls./day.

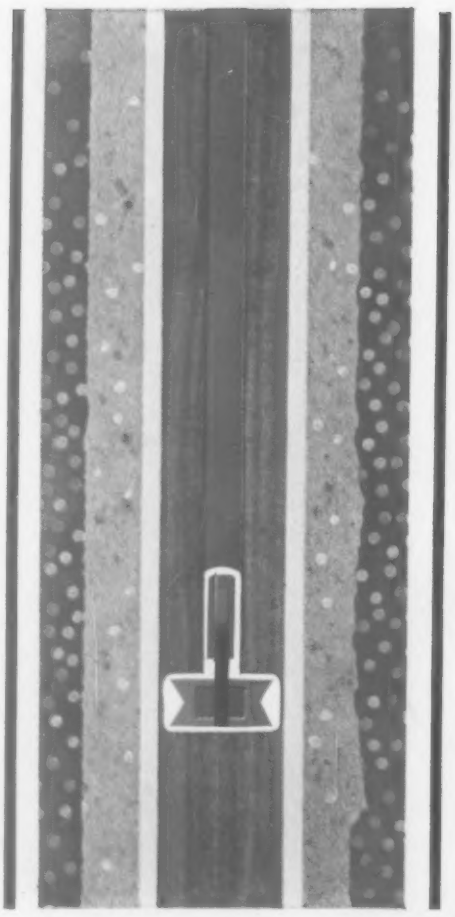
For a dozen years now, the basic technique of pumping fracturing fluids down the well bore under pressure to stimulate the flow of oil has been modified and improved.

But this conventional fracturing has its limitations. The industry has known this for a long time. At best, it is hit-or-miss. You can end up throwing several thousand dollars down a hole.

More often than not, you may be limiting your profits when your pay zone is thick or of low permeability.

It's also true that fracturing can give you disappointing results in a thin zone if the location of the fractures isn't right.

The scientific answer. Now, out of studies of fracturing at the Gulf Oil Corporation's Harmarville Research Center, comes an altogether new approach. One that all but takes the "miss" out of well stimulation.



For Gulf's development isn't just another technique. It is a precision system for fracturing. It replaces great gaps in our knowledge of fracturing with a painstakingly developed and tested body of scientific facts. It brings new ideas, new tools into play.

Our name for this precision system is Single-Point Entry Technique for fracturing.

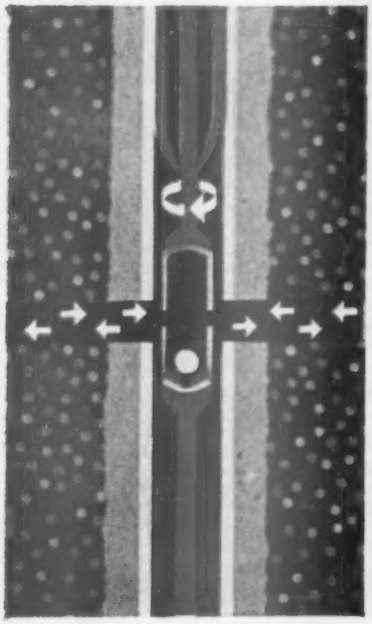
Up to 100 times the fracture capacity. Twenty-four service companies have already become Gulf licensees. In their hands, Single-Point Entry Technique for fracturing has already proved itself to be all our studies showed — and more.

One, it stimulates wells on jobs where conventional fracturing wouldn't even be worth a try. In itself, this characteristic moves

fracturing a long step ahead.

Two, Single-Point Entry Technique for fracturing usually outstimulates conventional fracturing techniques.

In both cases, Gulf's new system gives up to 100 times the fracture capacity of conventional fracturing. It has actually pushed productivity beyond the most hopeful expectations. In some cases, 20, 40, 60 times.



This system gives you all 3. Why does Gulf's new system give so much more than conventional fracturing? Because no conventional technique offers this scientific, systematic, 3-step approach: (1) precision fracture placement, (2) high fracture capacity and (3) an adequate reservoir drainage system.

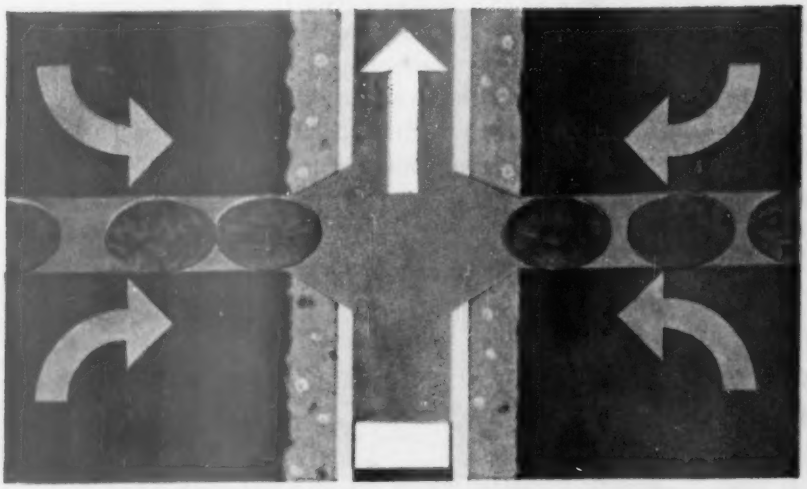
Now Single-Point Entry Technique for fracturing is available to boost your well flow levels. To pay you a sizeable number of bonus benefits as well. To improve reservoir drainage, for one. To lessen pressure drawdown. To lower gas-oil ratios. To minimize water coning. To make work-overs simpler.

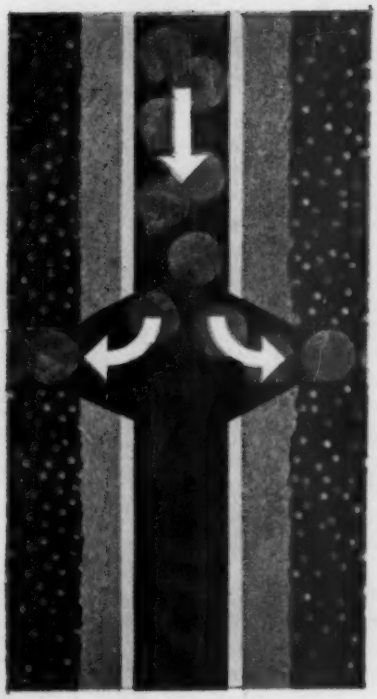
"Superhighway" for oil. No more hope-for-the-best fracture location. In Single-Point Entry Technique for fracturing, any one of three tools cuts the notch precisely where reservoir study says it should.

These tools include a mechanical cutter, a hydraulic notcher which jets an abrasive stream, and a ring charge for use in explosive notching.

No more helter-skelter fractures with Single-Point Entry Technique for fracturing. In their place, a single large "superhighway," extended deep into your pay zone.

And no more inadequate drainage. Your large fracture area and carefully prescribed propping agents assure that.





Just contact these licensees. It's so easy to have the Single-Point Entry Technique for fracturing custom-fitted to your well-stimulation needs. Simply contact any one of these Gulf licensees:

Acid Engineers, Inc. • Acme Tool, Incorporated • Axelson-Garrett Division, U. S. Industries, Inc. • Baash-Ross Division, Joy Manufacturing Company • Baker Oil Tools, Inc. • BJ Service, Inc. • Cardinal Chemical, Inc. • Chemical Sand Services, Inc. • Dowell Division, The Dow Chemical Company • Eline Acid Company (The) • Eskimo Fracturing & Well Servicing Ltd. • GO Oil Well Services, Inc. • GO-Western Service • Grant Oil Tool Company • Halliburton Company • Independent Oil Well Frac Company • Lane-Wells Company • Oklahoma Fracturing Services, Inc. • Producers Chemical Company • Sand Survey, Inc. • Servco Company (The) • Western Company (The) • Wireline, Inc. • Worth Well Surveys, Inc.

Unaflo oil-well cement,

CEMENTING DATA

Job — Hattie S. Welch #1, Jefferson Davis Parish, South Louisiana

Drilling Contractor — The Bullard Drilling Co., Inc., Houston, Texas

Owner — Austral Oil Company Incorporated, Houston, Texas

Job #1 — 7⅝" O.D. casing string set at 10,277' in 10⅝" hole, cemented with 500 bags UNAFLO cement plus 6% gel (slurry wt. 14.7 lbs/gal.) followed by 200 bags UNAFLO cement neat, (16.3 lbs/gal.). Drilling mud wt. 13.4 lbs/gal. Schlumberger temp. log 181° F. Est. static BHT 213° F.

Job #2 — 5½" O.D. liner, 2,146' long, bottomed at 12,000' in 6¾" hole cemented with 320 bags neat UNAFLO cement. Drilling mud wt. at cementing 16.4 lbs/gal. Schlumberger temp. log 255° F. at 12,160'. Est. static BHT 265° F.

Job #3 — 5½" O.D. full casing string tied to top of 5½" O.D. liner, using liner to casing coupling with 100 bags neat UNAFLO cement.

compatible with various additives...

UNAFLO oil-well cement is successfully used neat or with various types of additives in more and more cementing operations. For cementing casing or liner, squeeze cementing, plug-backs or recementing, UNAFLO cement slurries pump easily and set hard to provide an adequate seal. Its retarded set sustains high initial fluidity despite high temperatures and pressures. This allows time for proper placement plus a margin of safety for delays or emergencies.

For more information, write Universal Atlas Cement, 100 Park Avenue, New York 17, N. Y.

Universal Atlas Cement
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United States Steel

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THEY SAY

Time to sell?

Dear Sir:

As a long time investor in petroleum securities I can tell you that many of us are getting quite fed up with the plain stupidity within the industry.

With gasoline stocks at an all-time high I have just read that refinery runs reached an all-time high of 8,558,000 bbl. per day.

Can the responsible men in the industry, if there are any, really believe that price reductions sell one additional gallon of gasoline over a period of time?

Quite frankly I can't believe that the top men in the industry are that stupid, which leads me to the conclusion that there must be some ulterior motive involved.

Could it be to reduce crude prices and thus squeeze many small crude producers out of business?

As a subscriber to your excellent publication I am well aware of your forceful editorials and it is just inconceivable that the oil industry can so blissfully close their minds to your many sound suggestions.

The situation is fast reaching the point where we investors have but two choices: Either sell out and buy into an industry which has demonstrated fiscal responsibility, or bring enough pressure on Congress or the Justice Department to get a thorough investigation.

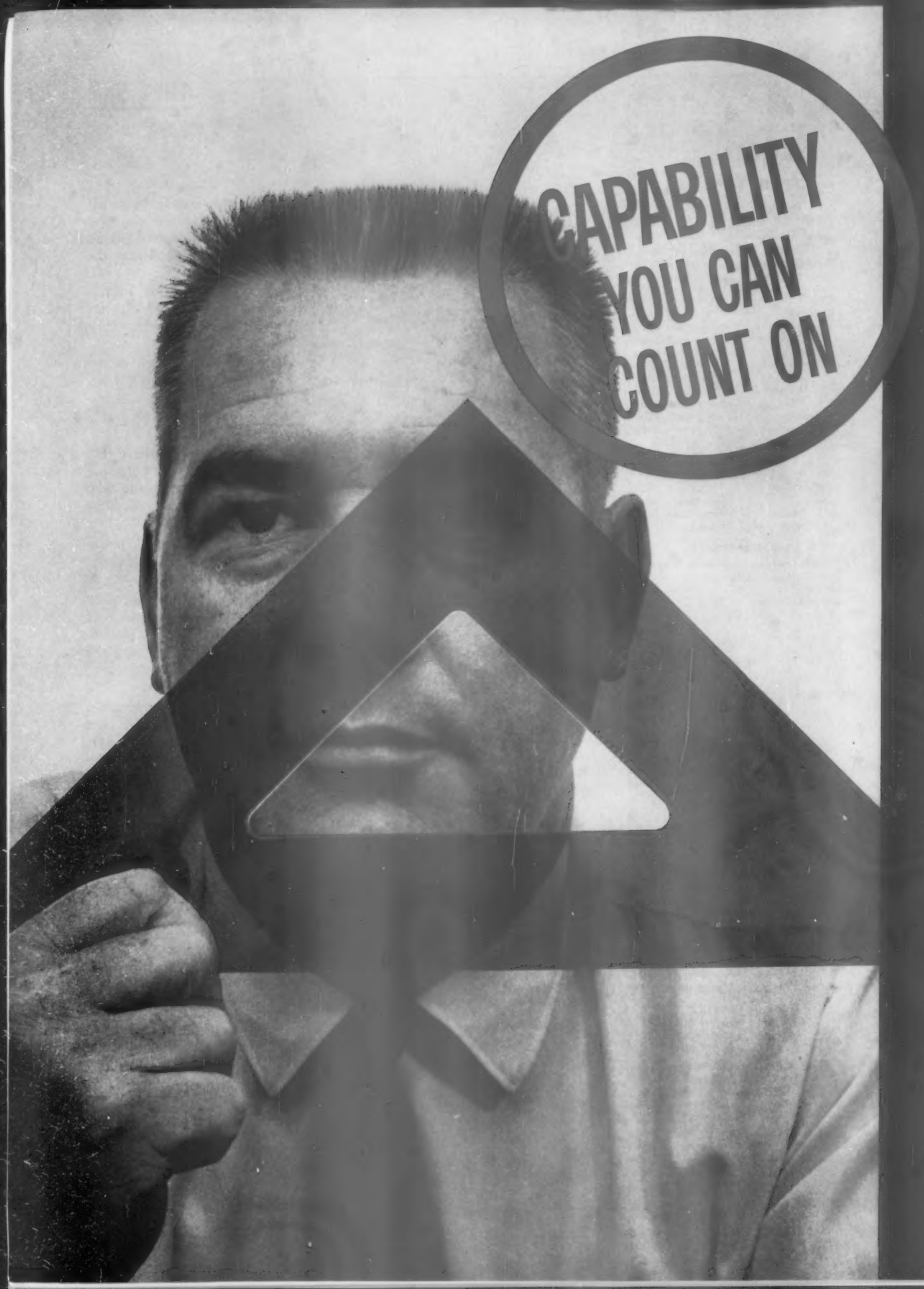
Believe me, we aren't going to wait very long before doing something about this deplorable situation.

John S. Miller
Wynnewood, Pa.

More credit to Jersey, please

Dear Sir:

In your comment on petrochemicals (OGJ, Sept. 4, "Journally Speaking," p. 87) you unfortunately did not give Standard Oil (N. J.) all the technical credit which it earned, even if it neglected to take advantage of its pioneering research. What about "Petrohol" (isopropyl alcohol), introduced about the mid 1920's, and the first synthetic ethyl alcohol which for a short period of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years Jersey shared with National Distillers. The company was one of the first in ethylene glycol.

But then, Du Pont delayed its entry into petrochemicals for a generation because a bright oil economist informed the company there was only an 18-year supply of oil in sight.

Sometimes the record becomes confused by claims and counterclaims.

Otto L. Schweng
Cerro Corp.
New York

It does make a difference

Dear Sir:

There was a sentence garbled in my article "New Tool Puts Finger on Faulty Crude - Tower Distillation" (OGJ, Sept. 4, 1961, p. 179) which befogs the meaning.

In the center column on p. 180, the statement should be:

"Considerable experience is helpful, and even necessary, to get the most out of comparing **the character of a curve with a curve. It is, of course, much simpler to compare** a curve with a straight line."

The line in bold face was omitted from the article.

G. C. Thrift
Koch Engineering Co., Inc.
Wichita, Kansas

Letters to They Say should be addressed to The Editor, The Oil and Gas Journal, Box 1260, Tulsa, Okla.

CALENDAR

OCTOBER

1-4 American Gas Association, annual convention, Dallas.
3-4 University of Kansas, ninth annual gas measurement institute, National Guard Armory, Liberal, Kans.
4-6 American Association of Oilwell Drilling Contractors, annual meeting, Rice Hotel, Houston.
4-6 American Society of Mechanical Engineers, process-industries conference, Shamrock-Hilton Hotel, Houston.
4-6 American Society of Photogrammetry, semiannual convention and technical exhibit, Biltmore Hotel, New York.
5-6 University of Oklahoma, annual gas compressor engines short course, Memorial Union Building, Norman, Okla.
5-7 Southwestern Legal Foundation, American Association of Petroleum Landmen, third national institute for petroleum landmen, Dallas.
6-8 New Mexico Geological Society, annual field conference, geology of the Albuquerque country, registration Oct. 5, University of New Mexico, Albuquerque.
8-11 Society of Petroleum Engineers of AIME, annual fall meeting, Memorial Auditorium, Dallas.
9-10 New Mexico Oil and Gas Association, annual meeting, La Fonda Hotel, Santa Fe.
12-13 California Natural Gasoline Association, annual fall meeting, Lafayette Hotel, Long Beach, Calif.
13-14 University of Texas, E. P. Schoch Lecture Series, Union Auditorium, Austin.
15-17 National Association of Oil Equipment Jobbers, annual convention and trade show, Mayflower Hotel, Washington.
15-18 American Petroleum Credit Association, annual conference, Shamrock-Hilton Hotel, Houston.
17 National Oil Fuel Institute, first annual meeting, Waldorf - Astoria, New York.
17-19 American Society of Mechanical Engineers, American Society of Lubricating Engineers, lubrication conference, Morrison Hotel, Chicago.
18-20 Rocky Mountain Oil and Gas Association, annual convention, Denver-Hilton Hotel, Denver.
18-21 American Association of Petroleum Geologists, Mid - Continent regional meeting, Amarillo, Tex.
19 West Central Texas Oil and Gas Association, annual meeting, Hotel Windsor, Abilene, Tex.
19-20 National Conference on Industrial Hydraulics, sponsored by Illinois Institute of Technology and engineering societies, Sherman Hotel, Chicago.
19-21 National Society of Professional Engineers, fall meeting, Hotel Roanoke, Roanoke, Va.
19-22 Louisiana Gulf Coast Oil Exposition, Lafayette, La.
20 American Institute of Chemical Engineers, South Texas section, annual technical meeting, Moody Civic Center, Galveston, Tex.
23-25 Pennsylvania Grade Crude Oil Association and Pennsylvania State University Mineral Industries Experiment Station, technical conference on oil recovery by solvents, Pennsylvania State University campus, University **Park.**
24-25 University of Kansas, Southwest Kansas Center, sixth annual natural-gas pipeline institute, Court House, Liberal, Kans.
24-27 National Association of Corrosion Engineers, south-central region conference and exhibition, Shamrock-Hilton Hotel, Houston.
25-26 National Petroleum Refiners Association, annual question and answer session on refining technology, Rufus Garrett Hotel, El Dorado, Ark.
25-27 Gulf Coast Association of Geological Societies, annual meeting, Granada Hotel, San Antonio, Tex.
27 Natural Gas Processors Association, southern regional meeting, Carlton Hotel, Tyler, Tex.
29-31 Independent Petroleum Association of America, annual meeting, Shamrock-Hilton Hotel, Houston.
29-Nov. 1 National Lubricating Grease Institute, annual meeting, Rice Hotel, Houston.
29-Nov. 10 Northwestern University, Transportation Center, executive seminar on transport costs, prices, and profits, Evanston, Ill.

NOVEMBER

1-3 Southwest Federation of Geological

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Now for any rig,

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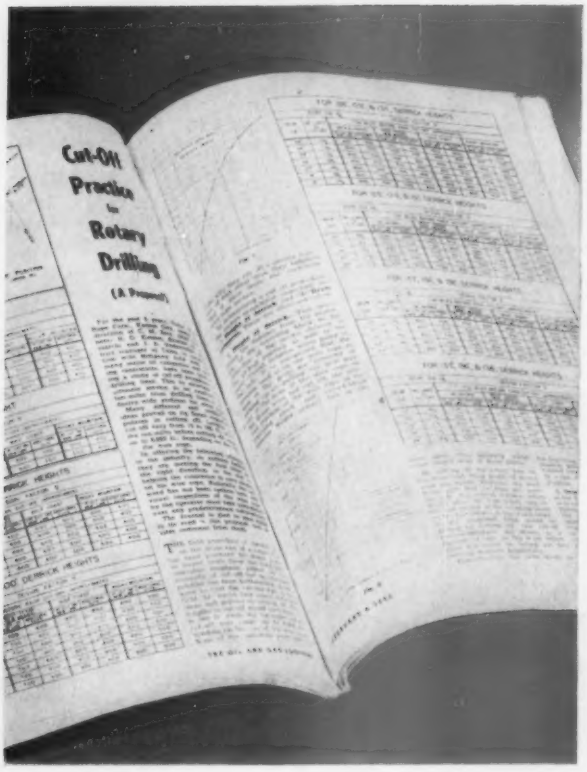
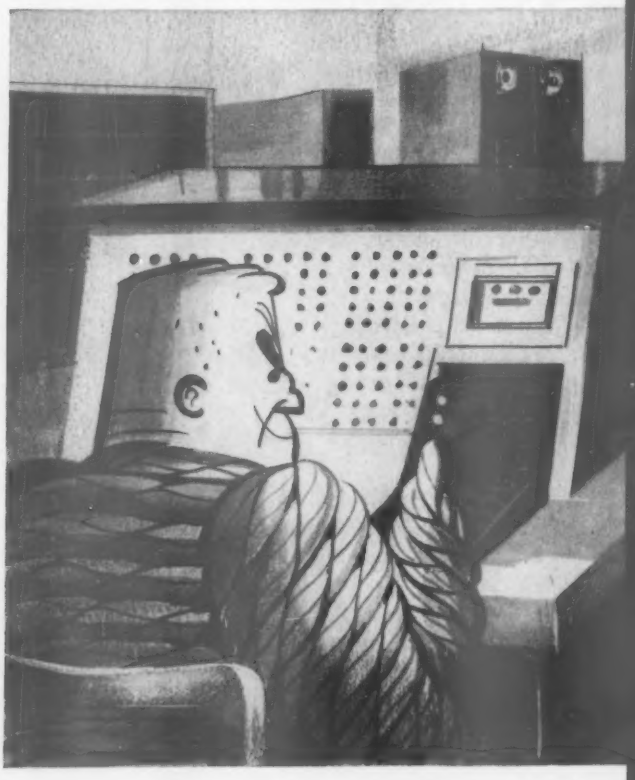




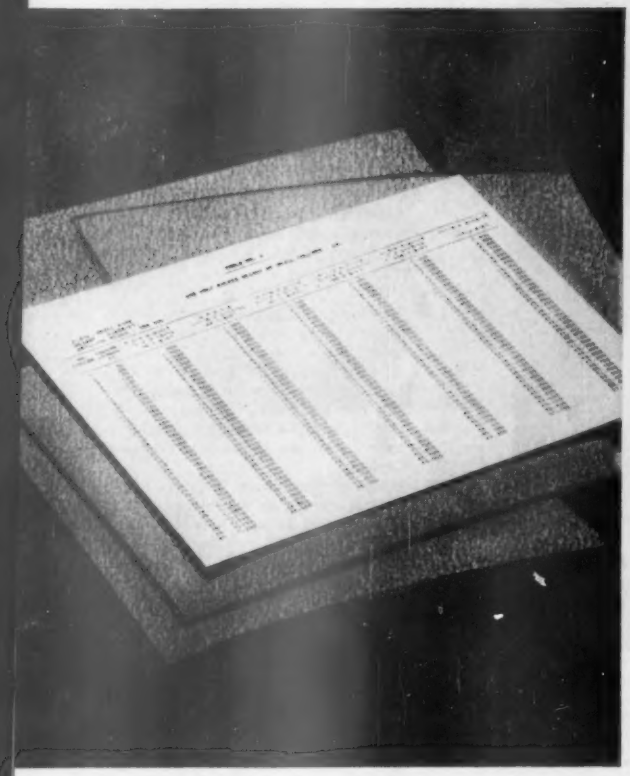
In 1952, after 3 years' work with company field men, major oil companies and drilling contractors, Union brought out the first workable cut-off practice for rotary drilling. It has helped contractors get more service and save money on wire rope and to avoid down-time and costly fishing jobs.

Electronic Brain, the IBM "705" has now been used to create Union's improved Electronic Cut-Off Procedure. It took 462 charts, with over 600,000 calculations, to cover all the variables. But now we have ton-mile charts that tell you the proper length and time to cut rope for maximum safe service for any drilling operation anywhere in the world.

Union Tuffy pioneers again. Using the same magic brain that it takes to get missiles and rockets off the launching pad, Union presents the next great advance in oil field wire rope cut-off procedure — an extension of the successful cut-off system which Union originated years ago. Union brings you this million-dollar service free. Try this improved Electronic Cut-Off Procedure on your next drilling operation. And be sure you specify Union Tuffy Standard Rotary Line, Union Tuffy Jackknife Rotary Line and the standard Union Oil Well Servicing Ropes. The best costs less on the long haul. For quick delivery, call your Union oil field supply store.

any drilling situation

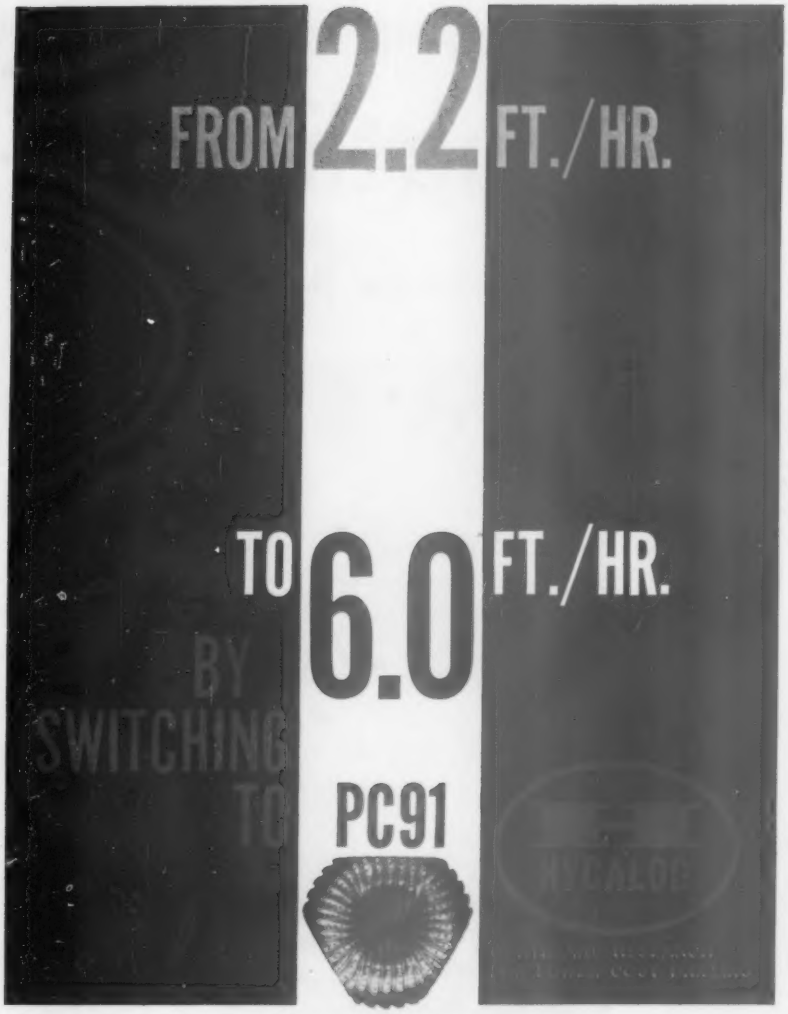
From 600,000 Calculations Made by "705" Electronic Brain



A Few Simple Charts are all you need—probably 5 or 6—to cover all your drilling operations. No great mass of figures to wade through. The whole Electronic Cut-Off Procedure is really simpler, much easier to use, more accurate. In fact, it is an electronic simplification of Union's own original cut-off procedure.

New Personal Field Service comes with Union's improved Electronic Cut-Off Procedure. Just outline your drilling plans. A qualified Union field man will bring the specific charts you need, and explain their use to you and your entire crew. **Write Union Wire Rope, Armco Steel Corporation,** 2102 Manchester Ave., **Kansas City 26, Mo.**

ARMCO **Union Wire Rope**



PERFORMANCE DATA

TYPE	FT. DRILLED	HOURS RUN	FT./HR.
MAKE A, ROCK BIT	3	2	1.5
MAKE B, ROCK BIT	11	5	2.2
HYCALOG, DIAMOND PC 91	**1440**	**240**	**6.0**

AT 12,000'-13,000' DEPTHS in South Louisiana where this run was made, the saving in trip time alone amounted to thousands of dollars. And the diamond bit cost no more than the dozens of conventional bits which would have been required to do the same job.

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Societies, annual meeting, Hilton Hotel, El Paso, Tex.

2-3 Society of Petroleum Engineers of AIME, annual California regional meeting, Hacienda Motel, Bakersfield, Calif.

2-3 API, annual agriculture - petroleum seminar, Louisiana State University, Baton Rouge.

2-4 Geological Society of America, annual meeting, Cincinnati, Ohio.

5-9 Society of Exploration Geophysicists, international meeting, Denver.

6-8 Chemical Institute of Canada, conference of the chemical engineering division, Royal York Hotel, Toronto.

9-10 Society of Automotive Engineers, national fuels and lubricants meeting, Shamrock-Hilton Hotel, Houston.

13-15 American Petroleum Institute, forty-first annual meeting, Conrad Hilton, Congress and Palmer House hotels, Chicago.

16 Illinois Oil and Gas Association, annual meeting, Mount Vernon, Ill.

17 Natural Gas Processors Association, Panhandle Plains regional meeting, Herring Hotel, Amarillo, Tex.

26-Dec. 1 American Society of Mechanical Engineers, winter annual meeting, Statler-Hilton Hotel, New York City.

DECEMBER

3-6 American Institute of Chemical Engineers, annual meeting, New Yorker Hotel, New York City.

4 AIME's Society of Petroleum Engineers, Arizona section, annual meeting, Pioneer Hotel, Tucson.

4-6 Interstate Oil Compact Commission, annual meeting, Denver Hilton Hotel, Denver.

5-6 National Petroleum Refiners, Association, computer conference for refiners, Hotel Tulsa, Tulsa.

JANUARY

7-10 Pipe Line Contractors Association, annual convention, Boca Raton Hotel and Club, Boca Raton, Fla.

8-12 Society of Automotive Engineers, annual meeting, Cobo Hall, Detroit.

16-18 Kentucky Petroleum Marketers Association, annual meeting and convention, Brown Hotel, Louisville, Ky.

19 Natural Gas Processors Association, Gulf Coast regional meeting, Robert Driscoll Hotel, Corpus Christi, Tex.

FEBRUARY

4-7 American Institute of Chemical Engineers, national meeting, Statler Hotel, Los Angeles.

14-17 Pipe Line Contractors Association of Canada, Castle Harbor Hotel, Bermuda.

15-17 Southwestern Legal Foundation, annual institute on the law of oil, gas, and taxation, Southwestern Legal Center, Dallas.

18-22 American Institute of Mining, Metallurgical, and Petroleum Engineers, annual meeting, New York City.

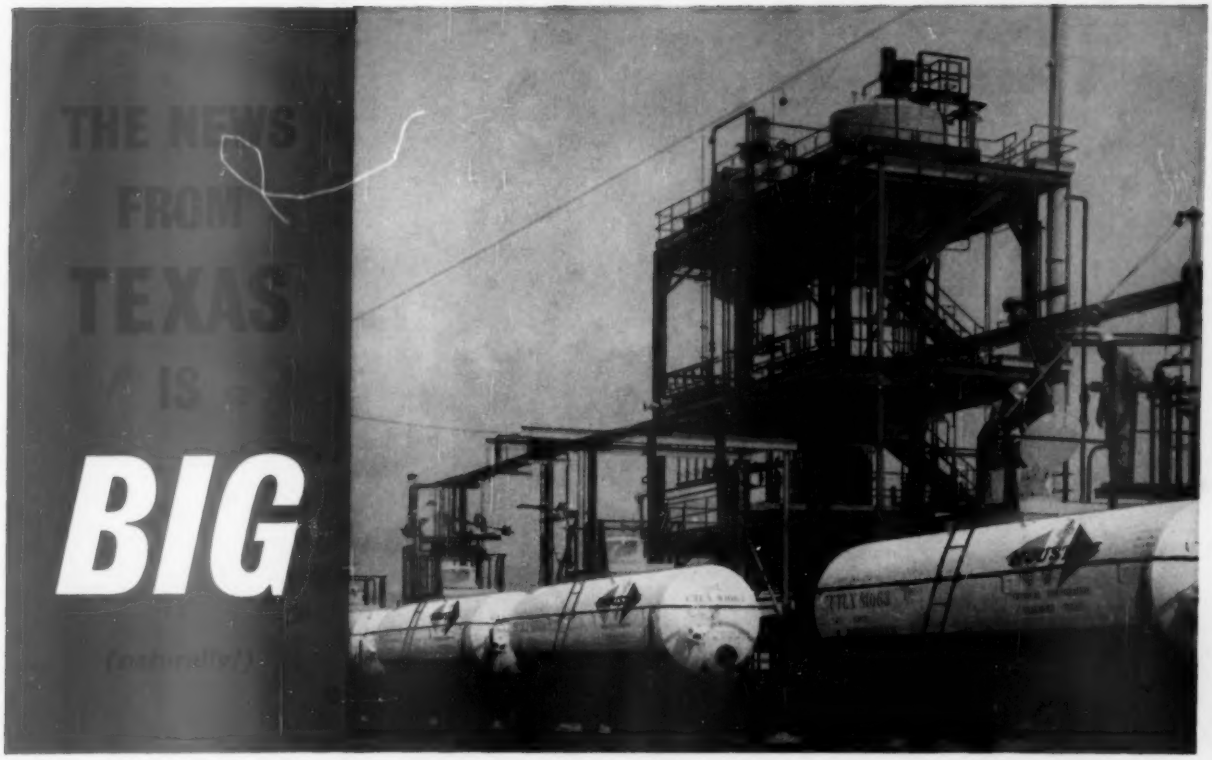
27-Mar. 2 International Oil and Gas Educational Center, institute on economics of the gas industry, Southwestern Legal Center, Dallas.

28-Mar. 2 American Petroleum Institute, Division of Production, southern district meeting, Rice Hotel, Houston.

MARCH

2 Ohio Oil and Gas Association, winter meeting, Deshler Hilton Hotel, Columbus, Ohio.

4-8 American Society of Mechnical Engineers, gas turbine-process industries



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conference, Shamrock Hilton Hotel, Houston.

16 Natural Gas Processors Association, Oklahoma regional meeting, Sheraton-Oklahoma Hotel, Oklahoma City.

18-22 National Association of Corrosion Engineers, meeting, Municipal Auditorium, Kansas City, Mo.

19-22 Kentucky Petroleum Marketers Association, management institute conducted by the University of Louisville, Brown Hotel, Louisville, Ky.

21-23 New England Gas Association, annual meeting, Statler-Hilton Hotel, Boston.

21-23 American Petroleum Institute, Division of Production, southwestern district meeting, Lincoln Hotel, Odessa, Tex.

26-29 American Association of Petroleum Geologists, Society of Economic Paleontologists and Mineralogists, joint annual meeting, Fairmont Hotel, Civic Auditorium, San Francisco.

APRIL

3 Chemical Institute of Canada, chemical economics division conference, Royal York Hotel, Toronto.

4-6 API, Division of Production, Mid-Continent district meeting, Sheraton Oklahoma Hotel, Oklahoma City.

9-10 Instrument Society of America, national chemical and petroleum instrumentation symposium, Wilmington, Del.

9-12 National Oil Fuel Institute, national oil heat and air conditioning exposition, Chicago.

11-12 Petroleum Industry Electrical Association and Petroleum Electric Supply Association, convention and exposition, Dallas.

11-13 API, Division of Production, Rocky Mountain district meeting, Hilton Hotel, Denver.

14-18 Petroleum Equipment Suppliers Association, annual meeting, Boca Raton Hotel, Boca Raton, Fla.

15-18 American Society of Mechanical Engineers, oil and gas power division conference, Shoreham Hotel, Washington.

17 Society of Plastics Engineers, Philadelphia section, regional technical conference, Sheraton Hotel, Philadelphia.

17-19 Southwestern Gas Measurement Short Course, University of Oklahoma, Norman.

17-19 American Society for Metals, regional conference and exhibition, materials and materials processing for the petroleum, petrochemical and chemical industries, Shamrock-Hilton Hotel, Houston.

23-25 American Association of Petroleum Geologists, Rocky Mountain section annual meeting, Salt Lake City.

25-27 Natural Gas Processors Association annual convention, Hilton Hotel, Denver.

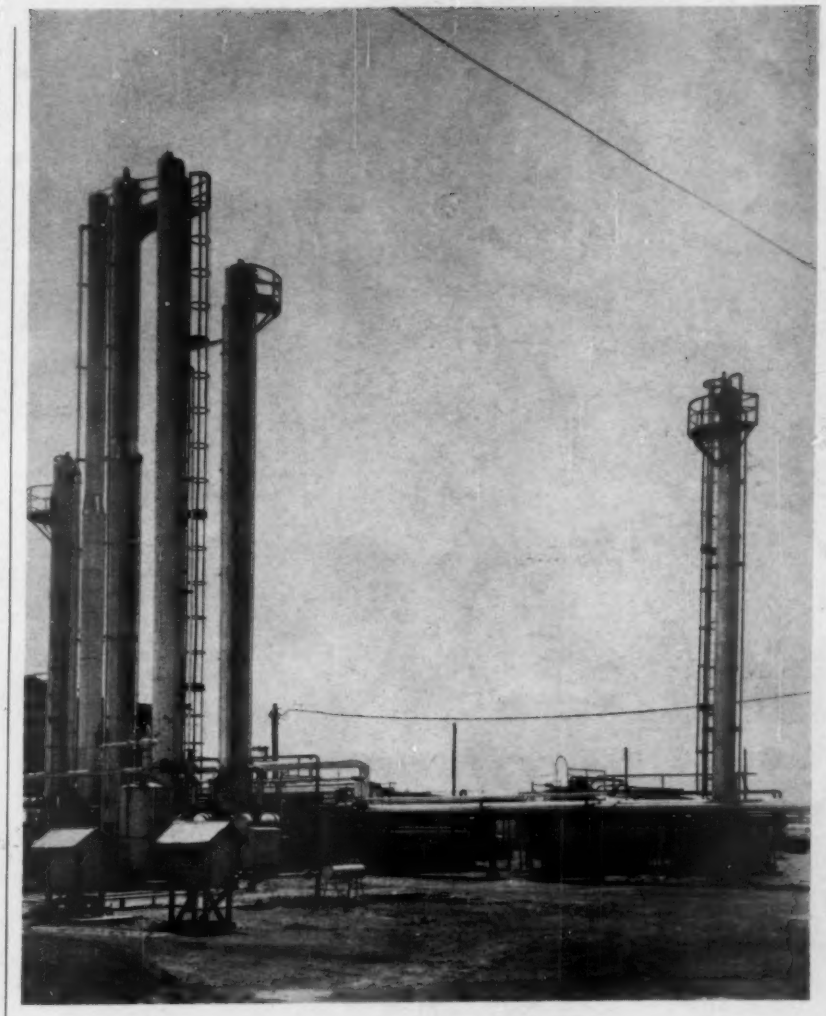
29-May 1 Independent Petroleum Association of America, midyear meeting, Hotel Muehlebach, Kansas City.

29-May 2 Liquefied Petroleum Gas Association, annual convention and trade show, Conrad Hilton Hotel, Chicago.

29-May 2 Southern Gas Association, annual meeting, and American Gas Association, transmission conference, Rice Hotel, Houston.

MAY

7-8 Society of Petroleum Engineers of AIME, North Texas section, fifth biennial secondary recovery symposium, Wichita Falls, Tex.



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THE JOURNAL SAID

50 years ago

October 5, 1911

Oklahoma and Illinois oil properties and rights valued at more than $850,000, and including 200 wells with a daily production of 3,500 bbl. have been acquired by Union Petroleum Co., of Paris. They consist of holdings of Wichita Gas Co., Best Oil Co., and Premier Petroleum Co., mostly in the Delaware area of northeastern Oklahoma; the personal holdings of T. N. Barnsdall and H. M. Preston; and lease of Fulton Oil Co. in Casey field, in Illinois.

J. H. Young, president of Alaska Steamship Co., and representative of the Morgan-Guggenheim interests in Alaska, predicts that before many months oil will be used as fuel in every part of the territory above Ketchikan. He said that in the 5 years his interests have waited for the opening of coal fields they have spent half a million dollars that could have been saved by using oil.

25 years ago

October 1, 1936

One of the biggest gas wells ever drilled in Oklahoma has been brought in by Anderson-Prichard Oil Corp. in the Moore field, south of Oklahoma City, in Cleveland County, Oklahoma. Flow of the well, 1 State, was estimated at 300 M.M.c.f. Its pay is Wilcox sand at 7,210-56 ft.

Daily oil production of the expansive Louisiana-Texas Rodessa field climbs to a record high level of more than 72,200 bbl. Sharp decline in output is expected with starting of new conservation program.

10 years ago

October 4, 1951

Trunkline Gas Co. starts flow of gas through its newly completed 1,300-mile, 26 and 24-in. pipeline from Texas and Louisiana Gulf Coast fields to Tuscola, Ill., where it connects with Panhandle Eastern Pipe Line Co.'s Hugoton-Michigan system. Trunkline completes its new $80,000,000 line a month ahead of schedule.

Petroleum Production Pioneers of California dedicate historical marker commemorating the discovery of the famous Midway field, 40 miles southwest of Bakersfield. Marker credits Chanslor-Canfield Midway Oil Co. No. 2-6 as the discovery well which made Midway oil field famous when it blew in November 27, 1909, flowing over the top of the derrick, and starting one of the greatest oil booms California ever experienced.

JOURNALLY SPEAKING

Operation cleanup

LATELY it's been popular to poke fun at "committees" and how they function and what they generate. About the most scathing remark to make about something is to say that "it looks like something done by a committee."

Often such ridicule is in order as some pretty bizarre efforts have been turned in by well-meaning but misguided committees.

But occasionally a really dedicated committee can go into a huddle and put its collective finger on some needs for improvement of a product, or a method, or a way of thinking. To such a committee, this veteran editor tips his hat (which he doesn't wear and is glad to find a use for).

We're speaking of a committee of three which was appointed early this summer to explore for ways and means to make the Journal more comfortable and pleasant to read, easier to find one's way through, and perhaps, more attractive as a package to send out every week.

This committee was composed of two editors whose usual stints are reporting and writing exploration and market news and who have nothing to do with "presentation," and one member of the presentation staff who is comparatively new at the business. They were told to free wheel, to invite suggestions from others of our 40 "odd" editors and anybody else who wanted to throw some ideas into the pot, and to distill, sift, sort, and turn in a report with some concrete recommendations by early fall.

Nobody in the shop was busier than these three throughout the summer. They got their heads together in the conference room, at luncheons, and elsewhere, and duly turned in a scholarly report, replete with Exhibits A through E, and specific recommendations.

The staff mulled them over, found many of them acceptable, sent others back for further study. And just to show you how fast on our feet we are at the Journal, some of the accepted suggestions are seeing light in this issue.

No, we haven't turned handsprings to achieve a totally different look. We already had a very readable type face, having increased its size only months ago. Our book already opened flat for ease in reading and clipping. And we haven't abandoned orderly, sensible layout that lets a reader sample to see if a piece is his dish or is something he can afford to skip. We still provide plenty of roadsigns to guide him through a story. Those flashy, startling—yes, almost paralyzing—layouts with type imprinted on color illustrations and reading matter tangled up with art may be all right for consumer magazines which cater to leisure reading (though personally we doubt it). But certainly there's no place for them in a business magazine edited for busy, active people with limited reading time who want to get full value from it.

No, we haven't done that. Ours is a tidying-up operation. We are sloughing off some of the results of, well, call it carelessness — that's what we called it—about details which, in sum, didn't do our overall appearance any good.

To illustrate what we are doing, you will note in this issue a uniformity throughout the book in our department headings: This gives the book more of a one-magazine look. We are adopting throughout the book the faster-reading lower-case headlines. We are standardizing on the use of boldface subheads, sideheads, and on paragraph indents.

We hope these and other continuing improvements which the committee suggested will make your reading of the Journal more rewarding.

—Lynn M. Nichols

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BAKER RETAINER
PRODUCTION PACKER
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THAT'S A TOUGH proving ground—one that has helped us soak up a vast knowledge of what happens to slips, packing elements, and the like, when a packer is downhole. We've got the facts.

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BAKER OIL TOOLS, INC. HOUSTON / LOS ANGELES / NEW YORK

BAKER

What's wrong with marketing—No. 1

THE MARKETING OF GASOLINE is in turmoil bordering on chaos. Dealer dissatisfaction is spawning legislative investigations and governmental litigation. Some drastic remedies have been proposed.

Large distributors are all experimenting with new marketing methods, pricing plans, and dealer contracts, most of which to date have only added to the confusion.

The basic cause of the troubles lies in certain ingrown attitudes of the petroleum industry, chief of which is the phobia for growth.

GROWTH HAS CHARACTERIZED the oil business for 100 years. During most of that time the industry was hard-pressed to keep up with the demand for oil. This generated the psychosis that continuous rapid growth is natural, inevitable, and essential for any company's existence.

In most other industries there is a disposition to find routes to profit other than through physical or geographic expansion. Not so oil.

Today the growth rate of oil demand has fallen to 2 or 3% annually—less than half that of former years. But few oil companies are content to grow that slowly. Nor do they give much consideration to the possibility that profits might be made to grow faster than volume.

Conditioned to the only form of progress they know—physical growth—most oil companies are determined to expand their markets by 5 or 10% a year. And when this can't be readily achieved by superior products or service, or by new advertising or merchandising gimmicks, they are usually quick to resort to sundry and often devious forms of market raiding and price cutting.

The craze to get a fast-growing share of a slow-growing market has caused the building of too many new filling stations and the retention of too many obsolete old ones. Fewer total outlets would serve the motoring public as well and at lower cost.

Not content with serving an area it can supply most economically, a company oversaturates that market and then fights or buys its way into the natural territory of others.

Common ways of doing this include fantastic price inducements for jobbers to switch brands, setting up dual brands to compete with the company's own dealers, raiding commercial accounts, using "hip-pocket" brokers to invade a new territory, and out-and-out price warring.

SUCH GROWTH can be achieved only by the destruction of competitors. That may not be the intent, but it is the effect. But competitors are equally intent on similar rapid growth, and by the same methods.

The result is chaos and cutthroat competition which, if long continued, could bring governmental regulation. Its root is the industry's inherent growth phobia and this stems from an infatuation with volume throughput, which will be discussed in the next editorial in this series.

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NO STOCK RECOMMENDATIONS

While the Bank is prepared to provide all available information on the oil industry, it does not make recommendations regarding the purchase of individual oil stocks.

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Coming battle:

Aluminum drill pipe vs. steel

Ed McGhee
Drilling Editor

IN the long and bitter fight between the steel mills and the aluminum companies, the next encounter seems likely to be in oil-well drilling.

When that clash begins, the apple of discord will be the very lifeline of the drilling process—drill pipe. To the victor will go a healthy metals market, and no matter who wins, there is a promise of cheaper wells for the oil industry.

Until now, virtually all drill pipe has been steel. So, in the struggle which seems imminent, steel plays the role of the defending champion—tough and completely ringwise. The challenger, aluminum, is not so strong and experienced but is aggressive and lighter on its feet.

A year ago, drilling men would have laughed to see a youngster so untried as aluminum aspiring to unseat the champion. Today, most agree that aluminum's victories in preliminary bouts earn it a shot at steel's long-held title. Latest success for aluminum drill pipe is the clean bill of health given by ultrasonic inspection to a string after 100,000 ft. of drilling.

When will the impending fight be held? Who will win?

Answer to the first question now rests with the challenger. If current tests prove as encouraging as those just past and if the aluminum companies can foresee a large enough market, they are prepared to attempt to capture this market. There are no uniform odds on the outcome of the Donnybrook which doubtless will follow a serious raid on steel's drill-pipe business.

Some expect the struggle to end in a "draw" with the two metals sharing drill-pipe sales.

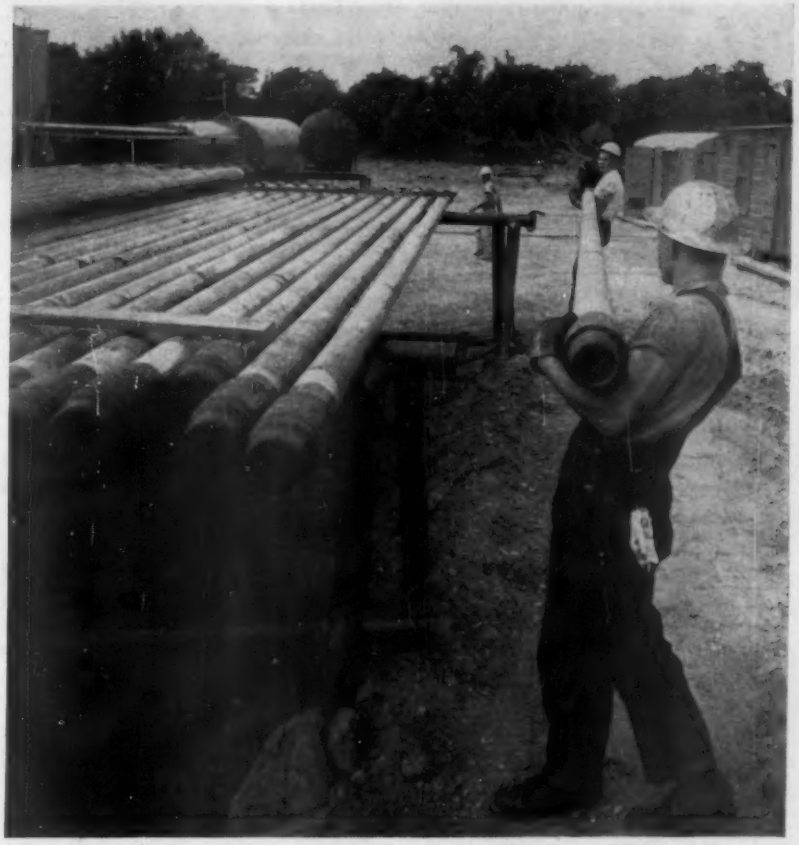
It isn't hard for the aluminum companies to find out how much drill pipe is sold each year. Their problem is predicting how much of that volume they might capture. Aside from the fact steel is a formidable competitor, producers of the lighter metal have these additional concerns:

1. A partial victory might be no victory at all. Aluminum must capture a large chunk of total sales if its makers are to recoup their investment in manufacturing equipment and in development cost.

2. It isn't enough to be a little bit better. Price and custom are on steel's side. The drilling industry might be reluctant to change unless advantages are overpowering.

3. Aluminum's value to the driller has a ceiling. There comes a point where it would be cheaper to use short-life, thin-wall or small-diameter steel pipe to achieve the weight advantage inherent in aluminum.

4. Regardless of drill pipe, oil-well casing will be steel. This means the operator who can drill to 10,000 ft. with aluminum drill pipe may feel safe to set only 7,000 ft. of steel casing with the same rig. It isn't practical to bring in a heavier rig to run casing, so the lightweight



LIGHT WEIGHT of aluminum drill pipe is graphically demonstrated as two men put joint on rack. Four men would be needed to lift similar steel joint.

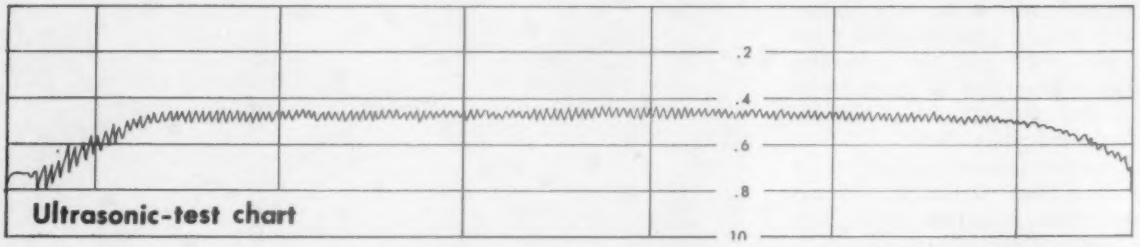
Aluminum passes test

PROPONENTS of aluminum drill pipe breathed easier last week after the product breezed through an important test: A thorough ultrasonic inspection (shown in progress at right) in Houston.

Under inspection was approximately one-third of the 11,000-ft. string which has drilled 100,000 ft. of hole for Shell in South Texas.

Since aluminum is nonmagnetic, conventional magnetic-type inspection methods can't be used. The ultrasonic equipment was provided by International Inspection, Inc. (Triple-Eye).

A typical record below shows no serious flaws. Sine-wave appearance of record is result of otherwise-undetectable eccentricity. Slope of line at ends reflects thicker walls at ends of joint.



Ultrasonic-test chart

of aluminum loses luster. Floating-in equipment eases this problem.

5. Steel drill pipe hasn't yet reached its peak. Ultra-high-strength steel pipe may grab the deep-drilling market being eyed by aluminum.

Tantalizing promise. The drilling industry is hardly a disinterested bystander in the fight that looms over drill pipe. Reason for drilling's interest is basic: Completely successful lightweight drill pipe would allow drilling with smaller rigs than are used now. Smaller rigs are cheaper rigs. Reduction of rig size likely carries more impact than any other advantage aluminum might claim.

Best example of drilling with smaller equipment is Shell Oil Co.'s Rig 25 (OGJ, Sept. 4, p. 98 and Dec. 12, 1960, p. 102). Rated to 7,000 ft. with steel drill string, the unit has successfully gone to 11,500 ft. with aluminum pipe. Aluminum drill pipe uprates the rig's draw works, mast, rotary, and substructure more than 60%.

Of course, these four individual items of rig equipment are not the whole. Other vital items of rig property are unaffected by use of aluminum pipe. For instance, a light rig which reaches 10,000 ft. with 4½-in. aluminum drill pipe needs just as much pump horsepower as does a heavier rig drilling to the same depth with 4½-in. steel pipe. For this reason, the savings in rig size are not quite so great as first seem apparent.

Still, Shell's operating expense for Rig 25 did not climb as fast as the unit's depth capacity. Though Shell has not disclosed operating cost for Rig 25, similar size rigs in the same area bring about $750 per day on day-work contracts. Conventional 11,500-ft. rigs cost $1,000 per day or more. Moreover, moving expense for the smaller rigs is perhaps two-thirds of the cost of moving the larger ones.

Casing floated in. Shell is the first company to be confronted by what is probably the most serious problem posed by reducing rig size.

That problem arises when weight of aluminum pipe in the hole reaches the load limit of the rig. Then comes the question: How do you run to bottom a string of steel casing? In virtually every case, the steel casing would weigh far more than the aluminum drill-pipe string and surpass the load capacity of draw works and mast.

Actually, the dilemma isn't an entirely new one. Rigs occasionally get into this situation when drilling deep with small-diameter steel pipe. The problem is a regular one on wells which call for inordinately long strings of large-diameter intermediate pipe.

Seldom is it necessary to bring in a bigger rig to run the heavy casing string. Usually, the pipe is simply "floated" into the hole, using the empty string's natural buoyancy in the mud to reduce load on draw works and mast.

Drillers and operators do not find floating-in operations entirely comfortable. There's always the chance of a failure which would cause the string to fill with mud. With buoyancy gone, the casing load could pull in the mast.

Floating has other dangers. It can cause higher-than-normal surges in pressure at the bottom of the hole.

Result can easily be loss of circulation, a poor cement job, and high completion cost.

Once on bottom, the heavy string cannot easily be reciprocated or rotated for cementing. Thus, chances for a good cement job are lower at the outset.

Despite dangers posed by floating casing strings into the hole, the majority of such jobs are entirely successful. In the half-dozen wells on which Shell's Rig 25 has floated casing, there has been no unusual trouble.

At first glance, it might appear that there's a simpler solution to the problem of casing weight: To make the casing of aluminum, too. And, the aluminum companies are mulling over casing-development programs. For now, however, no one is seriously suggesting that a satisfactory aluminum casing is in the offing.

$25,000,000 annual market. Sales of drill pipe have slowed to a virtual walk since the boom days of 1956 and 1957. Since that time, drilling contractors have bought few new strings so long as there was pipe to be cannibalized from their idle rigs.

In a recent year, it is estimated that drilling contractors in the United States and Canada bought 5,000,000 ft. of new drill stem. Under more nearly normal conditions, perhaps 6,000,000 ft. would be sold. Market value of this much steel pipe is more than $15,000,000, excluding tool joints. While this dollar volume is not so great as that for casing, it is hardly a market steel companies would care to lose.

Since aluminum costs more per pound than does steel, the same footage of aluminum pipe represents at least a $25,000,000 annual market. Is this figure sufficiently high to tempt the aluminum companies? Apparently it is.

Two firms, Reynolds Metals Co. and Aluminum Co. of America, already have invested heavily in aluminum drill pipe. Significantly, officials at Reynolds—manufacturers of the Shell string—say the company could mass-produce drill pipe on present equipment without major additional expenditure.

How long before the drilling contractor can order aluminum pipe for quick delivery? Not for some months. Reynolds is anxious to see 250,000 or 300,000 ft. of hole behind the Shell string before accepting orders indiscriminately. Alcoa is currently interested only in applications which it can supervise closely.

Big pipe, better hydraulics. Virtually all of the aluminum drill pipe to date has been 4½-in. o.d., a size common to steel pipe as well. In a full-scale marketing push, the aluminum companies would add the other popular sizes, 3½-in. and 5½-in. Many drilling engineers hope to see a quick test of 6⅝-in. aluminum pipe.

While 6⅝-in. steel pipe is available, it is too heavy for general use. With aluminum, a 6⅝-in. string would be no heavier and no harder to handle than some of today's smaller sizes.

Interest in 6⅝-in. pipe centers on one feature only: You can pump mud easier through a bigger pipe.

In a typical drilling operation, pressure loss through 6⅝-in. pipe is only about one-quarter as much as though 4½-in. pipe. That is, when all pressure losses (through pipe, annulus, collars, surface connections) are totaled, the rig using 6⅝-in. pipe could circulate with only 1,000 or 1,200 psi. on its pumps. The rig using 4½-in. pipe would have to put up 2,000 or 2,500 psi. to move the same volume of mud at the same depth.

The saving would be threefold:

Smaller, less-expensive pumps could be used.

Drilling could be speeded up as a result of better bottom-hole cleaning.

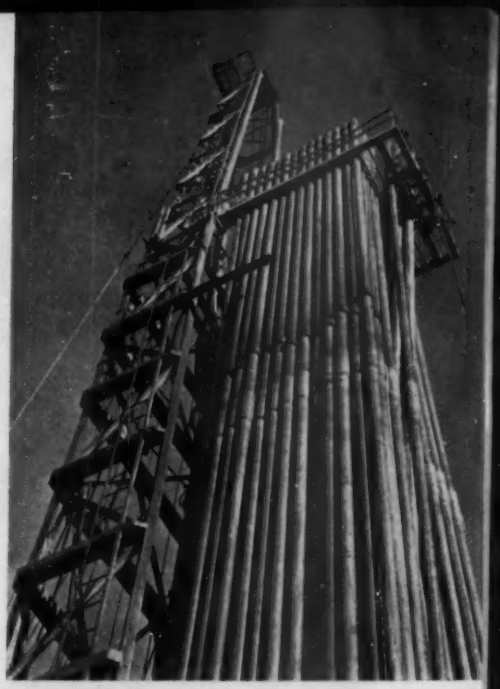
Pump maintenance would cost less at the lower pressures.

Lightweight steel. If weight were the only problem, the steel string could be lightened in two ways:

1. Use smaller diameters.
2. Use thinner walls.

The smaller the diameter of the drill stem, the more pump pressure is necessary to circulate mud. The thinner the pipe walls, generally the faster the pipe wears out. As a result, the cost of drill pipe per foot of hole drilled is usually higher with small-diameter or thin-wall pipe than it is with standard-size and standard-weight strings.

Aluminum starts its market drive with the same disadvantage: It costs more per foot of hole drilled than does standard steel pipe in most areas.



ALUMINUM drill pipe ready for use at Shell's Rig 25 on a South Texas location.

Reynolds Metals, for instance, is currently pricing its 4½-in. aluminum pipe at about $9.25 per foot, equipped with tool joints. Steel pipe similarly equipped costs less than $6 per foot.

The contractor must balance this higher cost against any savings he might realize by using aluminum. In addition to the rig-size reduction and improved hydraulics already mentioned, aluminum claims these advantages:

High scrap value—about $1.60 per foot f.o.b. Houston.

Uniform length, varying only a fraction of an inch in a 30-ft. joint.

Cheaper hauling since more joints can be carried per truck load.

Easier and cheaper handling on the rig.

Safety in sour-crude areas where steel fails rapidly.

Performance to date. Most complete performance record to date for aluminum pipe is that for the 11,000-ft. string operated by Shell's Rig 25. In drilling 100,000 ft. of hole during the past 12 months, this string scored these successes:

1. Ultrasonic inspection showed only minor defects.
2. There was no evidence of stress-corrosion cracking.
3. Slip and tong marks left no damage though the pipe was han-

dled in the same manner as steel pipe.

4. There were no twistoffs or other failures in the hole during the 100,000 ft. of drilling.

5. There was only minor abrasion wear on the outside surface and most wear occurred only on crooked joints.

6. There was no measurable wear from corrosion, either direct or galvanic.

7. No signs of trouble have appeared in the tool-joint to drill-pipe connection.

Internally, a number of joints were eroded early by a turbulent flow of mud. Erosion at its worst reduced wall thickness in a few spots to about 80% of original pipe thickness. In the remainder of the string where turbulence was less, walls retained 87% of original thickness and strength.

Reynolds, which extruded the Shell string, says future strings will use a new-design tool joint which reduces turbulence and cuts erosion so that 90% of wall thickness will be retained at 100,000 ft.

Steel companies do not consider 100,000 ft. of hole a conclusive test of their own product in South Texas. Many steel strings drill 400,000 ft. of hole and more. Moreover, aluminum pipe cannot work safely in alkaline muds with pH higher than about 11. Common acid inhibitors cannot be used with aluminum pipe.

For these reasons, the aluminum companies, the steel companies, and the drilling industry will watch closely the next 100,000 ft. of hole drilled by aluminum.

Canada to set export record

Last-half surge in crude flow to U. S. will push 1961 daily average to 178,500 bbl., well above previous high.

A SURGE in Canadian exports of crude oil to the United States in the last half of 1961 will boost volume 54% to an average of 178,500 bbl. daily for the full year.

This will be 62,500 bbl. daily above 1960 exports, and will easily exceed the previous peak of 153,000 bbl. daily achieved in 1957 partly as a result of the Suez Canal closing.

According to nominations and estimates filed with the Saskatchewan and Alberta Conservation Boards, exports will average 200,000 bbl. daily during the second half compared with 156,500 bbl. daily in the first 6 months. The breakdown includes 102,000 into the Midwest and 98,000 into the Puget Sound area of Washington.

The full year's flow of Canadian oil into the U. S. will be divided in this way:

93,000 bbl. daily into the Midwest, up 39% from 67,000 a year ago.

85,500 bbl. daily into the Puget Sound area, up 75% from 49,000 bbl. daily a year ago.

Sun joins importers. Sun Oil Co. showed up for the first time on the Alberta nominations.

As has been rumored for months, Sun will purchase 5,000 bbl. daily for its 95,000-bbl. Toledo refinery during the last quarter. Sun has continued to import a similar volume of Venezuelan crude for running at its Sarnia refinery.

This is in conflict with Canada's new national oil policy, announced February 1, which decrees that the market west of the Ottawa Valley in eastern Ontario belongs to domestic supplies. But at the end of this month, Sun will cease importing Venezuelan oil into Ontario.

Providing a market for Canadian crude in its Toledo refinery and dropping the Venezuelan imports will place Sun in a more comfortable position with both Canadian and Venezuelan authorities. The Venezuelan Government had also suggested this action, fearing that the small volume going into the "off-limits" market under the voluntary national oil policy would endanger Venezuela's 220,000-bbl. daily market in Quebec and the Maritimes.

Detroit-Toledo flow. With the Sun purchase, Detroit-Toledo refiners will be importing 37,000 bbl. daily into a market which at this time a year ago had not yet been opened to Canadian supplies.

During the last quarter of this year, Mobil Oil Co. will bring in 11,000 bbl. daily at Trenton, Gulf Oil Corp. 5,000 at Toledo, and Standard Oil Co. (Ohio) 16,000 at Toledo. In addition, Pure Oil Co. is making a spot purchase of 1,290 bbl. daily for its Toledo plant during October.

Ashland Oil & Refining Co. is importing 10,000 bbl. daily into Buffalo, which was penetrated by Canadian supplies for the first time last May.

Record ahead. Buoyed by exports to the U. S., Canadian production of crude oil and natural-gas liquids is heading for a record also.

Production of crude oil and natural-gas liquids is expected to reach 640,000 bbl. daily, the target set in the national oil policy. Earlier in the year the goal was considered to be unattainable, but a firming of Canadian demand and the last-half exports spurt should be enough to raise output to the desired level.

This will be 96,000 bbl. daily, or 18% above last year's figure of 544,000 bbl. daily.

Refinery runs shoot up as plants recover from Hurricane Carla's blows

REFINERY runs are moving back to pre-Carla levels.

Crude runs last week averaged 7,891,000 bbl. daily compared with 7,241,000 bbl. daily the week before when most of the Texas Gulf Coast plants were shut in for the hurricane.

For the country as a whole runs dropped 1,231,000 bbl. daily during the storm week and last week had regained 650,000 bbl. daily of the loss. On the Texas Gulf Coast, runs averaged 2,024,000 bbl. daily the week before the storm, dropped to 887,000 in hurricane week, and last week moved back up to 1,560,000.

Only other areas showing significant gains in runs last week were Louisiana Gulf Coast and Oklahoma-Kansas-Missouri districts. (See statistics, p. 267.)

One new trend: Additions to distillate stocks slowed down. Distillate stocks increased only 1,057,000 bbl. last week compared with average 4,800,000-bbl. increase for 3 weeks previous.

New burner device cuts home-heating costs

Humble says tests of Esso Research's grid show big fuel saving.

A BURNER improvement which cut home-heating-oil bills more than 20% in tests was disclosed last week by Humble Oil & Refining Co.

Savings were as high as 43% in 30 New York area homes last winter, Humble says. The lowest saving was 9% and the average was 21.2%. Burner efficiency was increased from an average of 71% to an average of 83%.

The average saving per home, the company says, was $53.50. Range in the test homes was from $19 to $119. The average saving during last heating season is about equal to the installed cost of new equipment added to the existing burner.

The new development is a grid used with an electric-eye type of ignition control. It can be added to all conventional high-pressure burners. That means more than 85% of all oil-burner installations.

Research discovery. This new concept in oil-burner operation was developed by Humble's scientific affiliate, Esso Research & Engineering Co., which has applied for patents.

It was an outgrowth of research into the character of oil-burner flames, which were photographed for the first time with ultra-high-speed cameras through quartz windows in a laboratory combustion chamber.

From these unique photographs, researchers learned that the high-pressure burner flame had a big hole in the middle. No combustion was occurring in the center of the flame pattern.

The reason, they discovered, was that the velocity of the air-fuel mixture being fed into the chamber exceeded flame velocity. The flame in the center was being blown out.

This condition is corrected by the grid. The metal grill breaks the air-fuel flow into swirls and currents that move slowly enough to ignite. The flame then spreads throughout the region where combustion fails to occur in a conventional chamber.

The ignition control cuts off the ignition electrodes when the flame starts in order to prevent coking on the grid.

Marketing plans. The grid and ignition control will be marketed immediately on the East Coast from Maine to Virginia in the territory of Humble's affiliate, Esso Standard, Eastern Region.

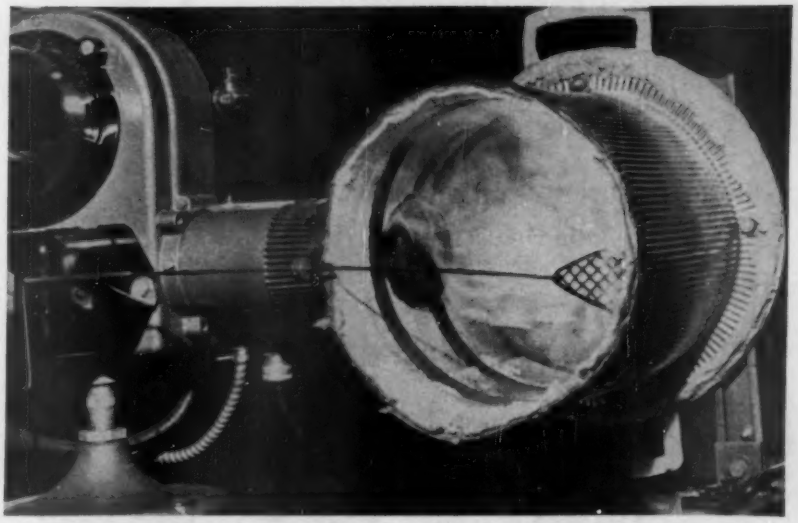
Equipment will be available from Esso dealers and distributors.

It will be manufactured by another Humble affiliate, Gilbert & Barker Manufacturing Co., West Springfield, Mass., and may be available to others later.

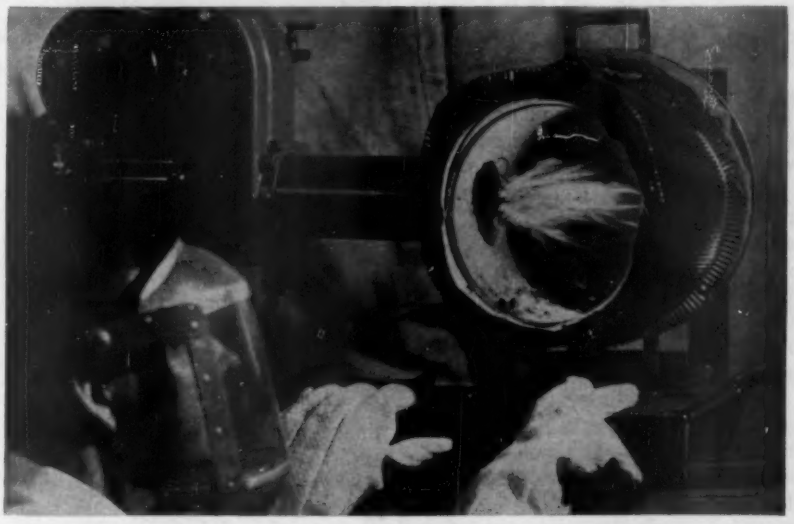
Humble said in its announcement of the burner development that it "could not have picked a more ideal time for the tests than the 1960-61 heating season."

"Many of the temperatures were among the lowest in the last 80 years," added the company.

The announcement also noted that some 10 million consumers spend about $2.5 billion annually for home heating oil.



UNCONTROLLED flame in combustion chamber of conventional high-pressure oil burner has a "hole" in it and doesn't get the most out of air-fuel mixture.



FLAME in conventional burner equipped with new grid control is smaller than usual flame, but produces same heat with less fuel consumption.

How FPC's Ross looks at his new job

Agency's newest member admits he's a novice on gas-industry issues.

But he's convinced of one thing: Regulation must be fair and firm.

Charles R. Ross . . . "Weak, uninformed regulation is no regulation."

CHARLES R. Ross, the newest addition to the Federal Power Commission, does not take naturally to federal regulation of business and industry, but he feels there are areas where such regulation is required—for the good of the industry as well as for the good of the general public.

As he sees it, our system with some control is far better than that of many nations where the government has taken over completely.

The 41-year-old Vermonter is convinced that if our regulatory system fails, government ownership will inevitably follow.

"That is why I feel so strongly that we cannot afford to fail," he said last week.

His concept of regulation is that it must be fair and firm toward both industry and consumer. "Weak, uninformed regulation is no regulation at all," he said.

Beyond outlining such general principles, Ross is reluctant to comment on natural-gas regulation. He readily concedes he has much to learn about the industry.

However, he does agree with FPC Chairman Joseph C. Swidler, who said in Houston recently it was obvious to him that gas production does not fall into the category of a public utility (OGJ, Sept. 25, p. 94).

Ross expects to give a great deal of attention in the early stages to the possibilities of area-pricing and small-producer exemption—two key issues on which the commission will take a definite stand soon.

An interviewer, basing his judgment on first impressions, would guess that Ross will go along with the area-pricing approach—at least at the outset.

Background. Ross is acutely aware that he is facing a tough assignment, but since his boyhood days he has had to face up to tough situations and challenges.

When Ross was 9, his father died and he had to begin assuming some family responsibilities. At college age, he faced the decision of working his way through school or not going. He worked, even while getting his law degree at the University of Michigan. And he still found time to take part in sports: Football (fullback), baseball (pitcher), and hockey—his greatest love. He captained the hockey team.

Ross found himself in another challenging situation in 1949 when he went into the construction business with a relative in Kentucky. Technically, he was supposed to handle the legal end of the business, but soon he was involved with submitting bids and ramrodding projects.

"When oil and gas people talk to me about competition, I know what they mean," he says, "because it's plenty fierce in the construction business. You can lose your shirt in a hurry there, too."

Although Ross enjoyed the construction work, his appetite and training for law caused him to return to his native Vermont and hang up his shingle. That was in 1954.

It wasn't easy, building a law practice. But he began making headway, handling a wide variety of assignments from contracts and leases to minor and major criminal cases.

New challenges. Ross won an election as alderman and, emboldened, ran for the state senate in 1958—even though his district is predominantly Democratic and he is a Republican.

He took a licking, but his fight attracted attention. The next year the governor appointed him chairman of Vermont's Public Service Board.

There he got acquainted with regulatory work because the board's authority extends over telephone and electric light companies, common carriers, and other utility-type industries.

Ross says he found, while serving in this job, that most people in business and industry are fair and reasonable, "although there always seem to be some who will take advantage if they can."

At the same time, he found that some consumers can be selfish and unrealistic too. So, he says, he soon learned to listen to all sides and to

discount the "extremists" on either side of an issue.

His tenure on the regulatory board caused him to become a student of regulatory theories and procedures. He read all he could find on the subject and asked endless questions.

Ross' attention was directed to the natural-gas industry because of the approach of natural-gas pipelines in neighboring states (Vermont does not yet have natural gas).

His interest really went into high gear when he learned that he was to be nominated to the FPC.

He knows he still has a lot to learn. So he intends to keep asking questions until he gets the answers he needs to enable him to cope with the problems awaiting him.

Hughes, Reed move into other fields to combat drilling slump

TWO leading manufacturers of drilling bits and tool joints have further diversified their operations into allied fields.

Hughes Tool Co. is offering a machine-tool rebuilding service at its plant in Houston.

And Reed Roller Bit Co. has purchased two California companies, Richmont Inc. and Livermont Inc., and will operate them under Reed's Cleco Air Tool division.

Hughes said the reduction in demand for bits and tool joints has prompted the company to diversify its operations.

"As we now see it, it will be some years before drilling activities in the United States and worldwide will reach the peak attained in 1955 and 1956," a spokesman for the company said.

The company has converted a 90,000-sq.-ft. unit to machine-tool rebuilding and believes the unit to be the largest and most modern of its kind in the nation. The plant is designed to serve manufacturers in 20 southern and southwestern states.

Reed said its acquisition of Richmont and Livermont, both of Monrovia, Calif., will put the company in a position to begin immediate marketing of precision-torque hand and power tools.

WATCHING WASHINGTON

Clyde La Motte

All FPC commissioners favor a trial for area-pricing

STRONG BACKING by other members of the Federal Power Commission will be given to Chairman Joseph Swidler and his efforts to make the area-pricing approach work.

It is unlikely that all members will agree on all the steps that lie ahead. But they are in general agreement that area pricing offers the best hope.

"We have to give it a trial," Commissioner L. J. O'Connor, Jr., says. "It is one of the few progressive movements available to us." And in talking of giving it a trial, O'Connor emphasizes that the industry as well as the commission should attempt to make it a fair, thorough test.

Commissioner Howard Morgan puts his stamp of approval in general on what Swidler had to say in Houston, including approval of the chairman's views on area pricing. He says there are "no significant differences" in his own opinions and those expressed by Swidler.

He does tend to emphasize one threat to area pricing that Swidler mentioned in his Houston speech but which did not get much attention: The possibility that the courts might upset the approach. Morgan notes that previous court decisions have indicated costs must be shown and any departure from costs must be justified.

The way he sees it, then, the courts might well rule that an individual producer would have to show that his cost figures qualified him for an area price. In other words, in such a setting the FPC and the producer would be back to the case-by-case approach again.

Commissioner Jerome Kuykendall was not in Washington last week, but it can be assumed that he will continue to support the area approach. After all, he was chairman of the commission when it announced the plan last fall.

The brand-new member of the commission, Charles R. Ross of Vermont, naturally is not nearly so definitely committed, but there is little doubt that he will be willing to give the area approach a trial.

Court rulings or congressional action may eventually change the picture, but for some time to come area pricing will be the procedure. Have no doubt about that.

Congress has quit, but oil studies will keep going on

CONGRESS is going to be conducting more oil-related hearings during the recess than it did during the regular session.

A subcommittee headed by Rep. Tom Steed (D.-Okla.) is already at work on the returns of a lengthy questionnaire to oil and coal companies as a part of the group's study of the oil-import-control program. And Rep. James Roosevelt (D.-Calif.) has mailed out questionnaires to determine whether service-station operators want to own their own stations—and whether they could finance them if they did want to buy.

The Senate Interior Committee currently is cranking up to make its fuels-policy study. The three ex-officio members have been appointed: Sen. Clair Engle (D.-Calif.), Sen. Norris Cotton (R.-N. H.) and Sen. Jennings Randolph (D.-W. Va.).

The staff of this committee is also about complete. It includes Samuel Lasky, from Interior's Bureau of Mines; Dr. John M. Ryan, an economist with Humble Oil & Refining Co., and Herbert J. Bickel, an economist for Texas Eastern Transmission Corp.

Chances are that the Steed and Roosevelt subcommittees will hold hearings during late fall. Hearings—if any—by the fuels-study group probably will not get under way until next year.

In the works: New marketing concepts

Many experiments are under way in all phases of marketing. Although the future shape of marketing isn't distinct, it's clear that changes are coming. One big aim: Build the merchandising power of stations.

NEW frontiers in oil marketing are beginning to stand out as the summertime gasoline price cutting extends into autumn.

When the smoke finally clears, here's what may emerge from:

Mania for growth. Several major oil companies will be marketing on a nation-wide scale. Many others will be better entrenched in their regions. The more aggressive independents also will be bigger, but there likely will be fewer of them.

New pricing experiments. The third-grade subregular and nine grades from one pump may erode historical price margins to a 1-cent spread between major and independent brands.

New marketing concepts. More super stations will be built by the majors and larger independents on the complete service-center concept. These may be surrounded by satellite filling stations which concentrate on selling gasoline and feed the big station wash and lube jobs, repair work, and TBA sales. Use of salaried personnel will increase.

A variety of other products may be merchandised at service stations with a trend toward harder sell and greater promotion. The smaller independents will continue to hit hard with streamlined marketing of gasoline.

And back of all these trends lies the increasing threat of more political control over oil marketers from Washington.

1. Fight for markets.

Most marketers agree privately there is too much emphasis currently on growth and increased gallonage.

This expansionist tendency is coming at a time when growth of demand for petroleum products is slowing up. The inevitable result is an attempt to get individual growth by cutting prices. The economics of supply and demand are ignored (OGJ, Sept. 18, p. 66). The gains made by cost cutting, automation, and greater efficiency are being thrown away by price cutting at the gasoline pump.

It's easy to explain how this growth mania developed. Texaco, which markets in all 50 states, gets great benefits from national advertising and promotion, picks up extra business from credit cards which are good over the nation, and escapes effects of regional recessions by spreading its business over a wide base. These advantages have become apparent to other companies.

Humble, Indiana Standard, and Mobil all have consolidated and reorganized their several affiliates into a single company and are fast making the big step into national marketing. Gulf, by acquiring Wilshire on the West Coast, and California Standard, by picking up Kentucky Standard in the Southeast, also are headed in that direction.

Several other companies, such as Phillips, Shell, Continental, Sinclair, and Cities Service, either by purchase or construction are expanding their traditional markets to get more business. A host of regional marketers are making determined moves to hold their own against these competitors and grow in their own home territory.

Independent marketers, meanwhile, aren't standing still either. They have parlayed good supply contracts, good service, smart station designs, and lower prices into greater gallonage. In many markets they have become so large a factor the majors view their low prices as a serious threat.

The result of this tremendous emphasis on growth is that every marketer is jumpy about prices. Any move by a competitor to increase gallonage by reducing price is met by a counter price cut. The downward price spirals this summer have hit ruinous lows.

The situation prompted Reid Brazell, president of Leonard Refineries, Inc., and also president of the National Petroleum Refiners Association, to declare last month at the NPRA convention in Atlantic City: "I challenge each of you to see if you have guts enough to do the job in your own companies that needs to be done."

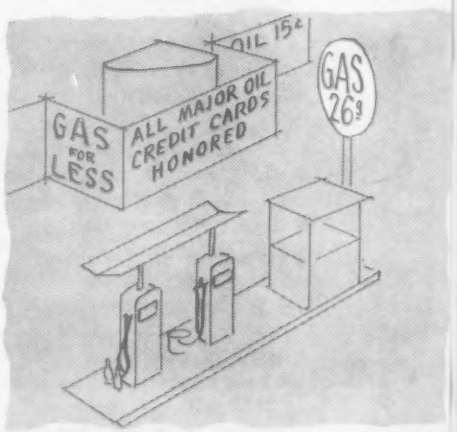
E. K. Bennett, president of the National Oil Jobbers Council, also observed "there is evidence that some major integrated companies are coming to realize the folly of their suicidal pricing and volume policies in gasoline."

Many marketers believe that companies will have to be content with more modest growth if profitable prices are to be maintained. Just how this will be achieved on an industry scale is the unanswered question.

2. Pricing trends.

Gulf and Sun have tried out novel pricing experiments this summer, both aimed at meeting the threat of independents and private branders.

In several markets Gulf has installed Gulftane as a third grade, economy regular which is priced 1 to 2 cents below its regular Good Gulf.



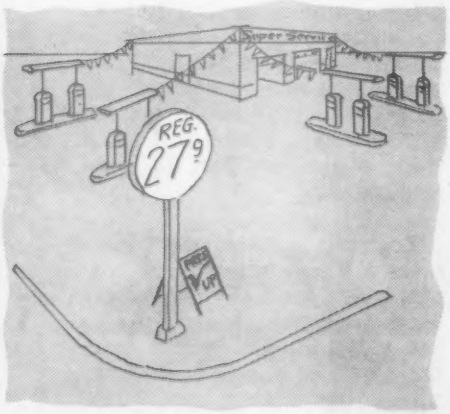
"Price margins between the may erode to one cent."

"Complete service-center complex is being tried by some majors."

Sun has opened its nine-grade blending pumps to two subregular grades—Sunoco 190, priced at 1 cent below major brands to meet the independents, and Sunoco 180, priced at 2 cents below to meet the private branders.

Both Gulf and Sun reportedly have experienced good volume gains in areas where they have moved. Their profit realization, however, may be another story. In most areas where Gulf and Sun have tried their pricing tests, violent price wars have resulted. Other majors and independents alike cut to meet the competitive threat.

Echoing the reactions of many others, the pricing manager of one major in New York told the Journal that "marketing three grades or cheapening an existing grade is not the way to cope with the independents' rise in gasoline volume."



independents and majors

"It is certainly no solution to price wars," he added. "After the current jockeying is over, we will see emerge a new pricing structure. Yesterday's margins will go out the window.

"We'll have to learn to get along with narrower margins—this applies to the supplier, distributor, and dealer. Also the 2-cent differential is on the way out. All marketing elements can live with a 1-cent differential, and this is what probably will come out of all the various pricing experiments."

Gulf officials talk very little about their plans. They call the new economy Gulftane just an effort to get more business. Since price has become such an important part of gasoline retailing, Gulf is trying to determine to what extent the public will accept an economy gasoline under a quality brand.

Sun talks even less, but apparently is changing its strategy. It has entered the Indiana and Chicago metropolitan area with only eight blends, dropping Sunoco 180 which was 2 cents under major regular and was even with private brands. The lowest blend now is Sunoco 190, which is 1 cent above private brands. This is expected to set the pattern for Sun pricing in Charlotte, N. C., and other markets where nine blends have been introduced.

Marketers generally expect the Gulf and Sun experiments will result in reduced price margins and will leave a 1-cent differential between major and private brands.

As for multigrade marketing of gasoline, most company executives hope the idea dies quickly. Third grades have been tried several times in the past and never have proved too profitable.

Marketers admit the octane needs of the present car population, however, present some ticklish problems. Some feel Sun may be in an excellent position with its ability to offer a variety of octanes by blending two basic ingredients. Most, however, feel that two grades will prevail by meeting the needs of most autos.

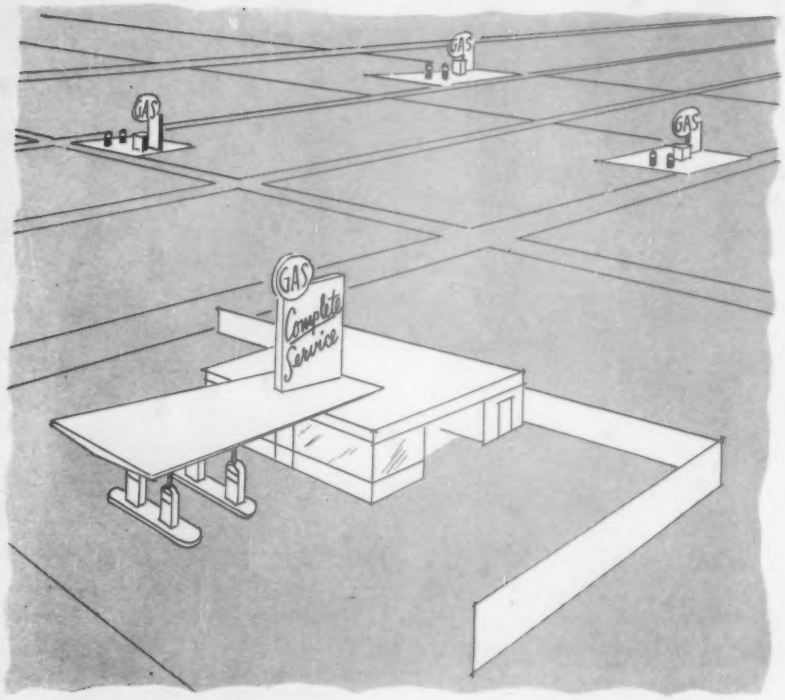
3. New concepts.

The big debate in marketing is whether the motorist just wants to buy gasoline and drive quickly away from a station or wants to have a full line of service available.

Majors long have argued for full service plus tires, batteries, and accessories. Independents for the most part and private branders unanimously contend all the motorist wants is a quick tank of gasoline. He can take his car to a garage for repairs and to an auto store for accessories.

There's a move afoot among some companies to combine both ideas and to add other merchandising tactics to their strategy.

American Oil is having success with super stations offering the full line of service and products, centrally located in a market and de-



"Satellite stations selling gasoline only feed other business to super station."

signed to replace several smaller struggling stations. It is altering this idea at Vincennes, Ind., however, by planning a gasoline-only satellite station about 2 miles from the central outlet. The satellite will have no lube bays and won't offer special services of any kind.

Other marketers have the same idea in their planning. One conceives the ideal future market setup as this: A big showcase station in each market offering all services and repairs up to major overhaul, plus selling a variety of TBA. The station would be a fancy multipump, multibay affair. Located strategically around this super station would be several gasoline - only stations. These satellite stations would offer to take customers' cars into the central station for other services. The satellites thus would feed extra business to the big station.

Pure Oil eventually plans a string of big Auto Service City stations in its marketing area. Each will be geared to hard promotions locally of special sales on service and TBA, and will upgrade the company image in an area—thus helping conventional outlets.

DX Sunray plans to extend its novel circle-station design. Its prototype in Tulsa not only offered something new in design but also—just as important—was backed up by new merchandising tricks.

Sohio, Esso, and others are experimenting with combining stations with cafes, motels, quick - wash places, shopping centers, discount houses, and recreation centers. The strategy is to broaden the merchandising base to take advantage of traffic flow.

The larger independents are borrowing some of the majors' ideas on full service, credit cards, stamps, and similar offers. But for the most part the fast-stepping operators are sticking to their successful formula of large sites, plenty of driveway space, multipumps, good lighting, fast driveway service, and cheaper prices to grab big-volume gallonage.

4. Danger signs.

Every marketer admits there is no pat solution to current problems in marketing. Anyone who has one can name his own price.

Marketers fear that unless industry leaders soon show some signs of curbing excesses in the market place, the industry will suffer from:

Overbuilding. Many majors claim they are closing marginal stations at a greater rate than they are opening new ones. Whether this is true on a national scale is debatable. Frontier Refining Vice President Robert Johnson of Denver still describes the situation as not one of overbuilding but underdestruction.

Declining profits, if prices are not stabilized. About 60% of a refiner's profits comes from gasoline. Prices that approach cost, or fall below it, make dismal reading on the profit-and-loss statement.

Increasing controls. The marketing segment already is jittery about possible fair-trade investigations or antitrust suits by the Justice Department. Any continued price cutting that hurts the independent section of marketing is sure to add to the clamor for divorcement of marketing from other industry activities.

The divorcement issue may soon come to a head one way or another—either by direct law forcing producers and refiners to divest themselves of retail marketing facilities, or by special loans to lessee station operators to buy their own stations from their suppliers.

At any rate, probably never before has so much concentrated hard thinking been devoted in the oil industry to marketing problems. And one thing is certain about the present chaotic situation: Changes in the traditional ways of doing business are on the way.

INDUSTRY BRIEFS

A 10-cent per barrel cut in price of crude in four southern Louisiana fields will result from sale of a gathering system by Gulf Refining Co. to Lafitte Oil Traders, Inc., a subsidiary of Cities Service Petroleum Co. Lafitte announced that effective October 1 it will pay only $3.23 top price for oil in Edgerly, Starks, Vinton, and East Hackberry fields.

Producers in Virgin and Toronto fields of Kansas will bear the brunt of a 5-cent per barrel rate increase for gathering being made by Arapahoe Pipe Line Co. Sinclair Crude Oil Co. has been absorbing the former 10-cent charge on 1,250 bbl. daily from the fields but will pass along 5 cents of the new 15-cent charge to producers. Arapahoe is

Honolulu votes to close sale

Stockholders take action despite antitrust suit and lack of a tax ruling. Closing date set for October 18.

STOCKHOLDERS of Honolulu Oil Corp. are gamblers.

Last week they approved by an overwhelming majority the $361 million sale of the company to Pan American Petroleum Corp. and Tidewater Oil Co.

They boldly gave management authority to close the deal despite an antitrust suit hanging over their heads and the lack of a favorable tax ruling from the Internal Revenue Service.

The company is hopeful of receiving an IRS ruling any day now, and also hopes to beat down the Justice Department's antitrust charges in San Francisco Federal District Court next week (October 11).

If the company stops the injunction sought by the Justice Department and gets IRS clearance, then the way will be cleared for closing the sale October 18. Stockholders approved this closing date at their special meeting last week.

Clearing the hurdles thrown up in Washington will end months of negotiations not only with the prospective buyers but also with several other companies who sought to buy Honolulu. Pan American and Tidewater were top bidders in an unusual sales arrangement that saw the company put up for bids.

Justice charges. The government's case against the sale is based on a claim that Pan American and Tidewater would require production that would give them a "decisive competitive advantage" over smaller and less integrated firms.

There are little grounds for such charges based on Honolulu's 1960 sales of crude and natural gas. A recent proxy statement put out in connection with the sale shows Honolulu sold roughly 71% of its crude and 76% of its gas to some of the industry's biggest companies in 1960.

The bulk of Honolulu's production is in Texas and California—and sales to majors far outstripped sales to independents in these two states. Only in the Rocky Mountains were sales to independents predominate.

Here's a state-by-state rundown on Honolulu's 1960 sales:

Texas: Mobil Oil Co. purchased 44% of the crude, Indiana Oil Purchasing Co., a Pan American affiliate, bought 30%, and Shell Oil Co., 19%. These three majors thus accounted for 93% of the crude sold in Texas.

Phillips Petroleum Co. bought 91% of the LPG and 93% of the natural-gasoline sold in Texas. The two big natural-gas buyers were El Paso Natural Gas Co. with 43% and Phillips with 14%.

California: Standard Oil Co. of California bought over 90% of Honolulu's crude in 1960. The big gas buyers were Pacific Gas & Electric Co. with 52% and Southern California Gas Co. with 43%.

Wyoming and Montana: Berry Refining Co., an independent, purchased 80% of Honolulu's crude in Wyoming last year, and Western Crude Marketers, Inc., another independent, bought 11% of the Wyoming crude and 100% of the Montana production.

Wyoming and Montana accounted for 11,286 bbl. daily or 29% of Honolulu's crude production in February, the latest month mentioned in the proxy statement.

The Justice suit charging violations of the Clayton and Sherman Antitrust Acts also names Standard Oil Co. (Ind.), Pan American's parent, and Getty Oil Co., Tidewater's parent.

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jointly owned by Sinclair Pipe Line Co. and Pure Oil Co.

Exchange of research information for future cooperative development of fuel cells is planned by Sun Oil and Electric Storage Battery Co., the nation's oldest producer of packaged power devices. Sun has conducted research in catalyst systems used in fuel cells. Electric Storage has developed electrodes for fuel cells.

Purchase of 26% interest in 522 producing oil and gas wells in Texas was announced by Texas American Oil Corp., Midland. TAO bought the properties from A. W. Rutter, Jr., Midland, for an undisclosed amount of cash. The wells are in the Sohio Driver Spraberry unit.

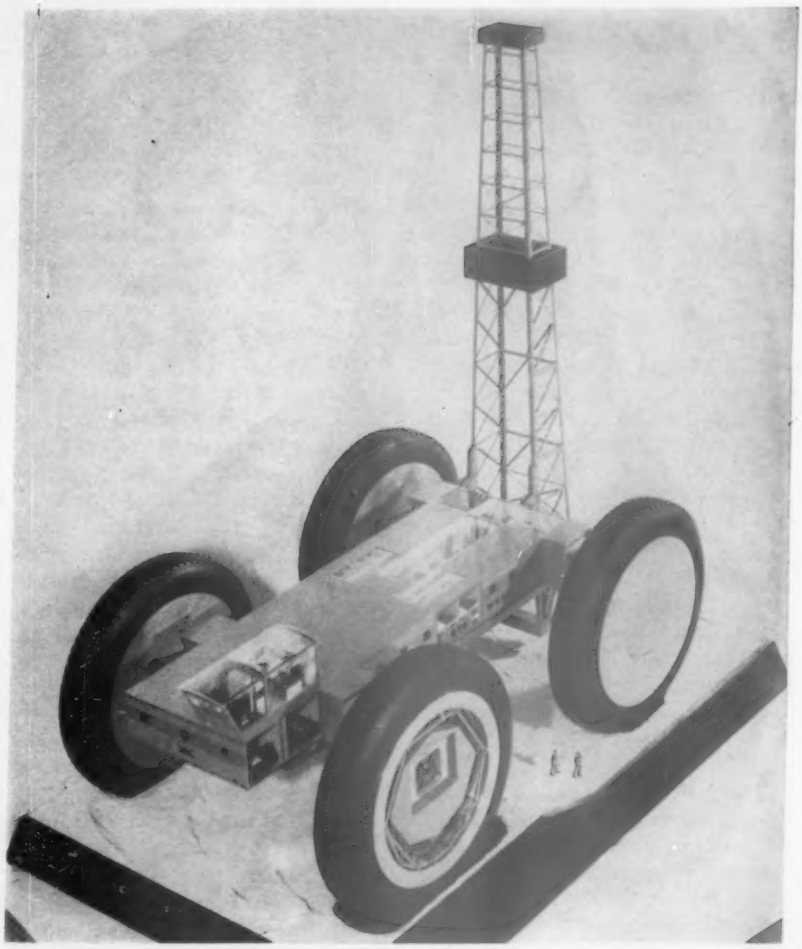
Helium - transport equipment recently acquired by the Bureau of Mines will serve purchasers of government helium who cannot be reached by railroad. The bureau obtained five semitrailers for a total of $140,000. Each trailer has capacity of 88,000 cu. ft., and most of them will be used at the Government's Amarillo, Tex., helium plant.

Acquisition of the producing properties of Gulf States Development Corp. and most of the producing properties of C. C. Winn, San Antonio, Tex., has been completed by Associated Oil & Gas Co., Houston. Gulf States assets include 17 oil wells and 31 gas wells on 10,793 acres in seven South Texas counties. The Winn properties include 89 oil wells and 22 gas wells on 7,196 acres in 22 South Texas fields. Associated acquired the properties by exchange of stock and for cash.

Controlling interest in Dorchester Corp., Amarillo, Tex., gas-producing and processing company, has been purchased for $4,600,000 by Georesearch, Inc., Dallas. Georesearch acquired 67% of Dorchester common stock and all outstanding first - mortgage notes. Dorchester owns interest in 241 gas wells and 145,000 lease acres in Kansas, Oklahoma, and Texas.

October allowables in Kansas and Oklahoma will remain at the same level as last month. Kansas production will total 300,000 bbl. daily, and Oklahoma 505,000 bbl. daily.

First Standard Oil of California operating company to work 1 million man-hours without a lost-time accident is the California Co., headquartered in New Orleans. Calco's record started May 21 and is continuing.



Arctic scooter to wade rivers

A GIANT transporter, dubbed the Big Wheel, has been designed to overcome tough transportation problems imposed on men who want to develop the rugged Canadian North.

The model above shows what its designer claims is possible. It carries an oil drill rig over 100-ft. high plus supporting pumps and drilling equipment. Accommodation is provided within the vehicle for a 40-man drill crew and a modern kitchen, dining room, bedrooms, recreation lounge, showers, washrooms and fully equipped workshops.

The transporter is being developed by the Avro Aircraft Division of A. V. Roe Canada, Ltd., of Malton, Ontario, and was first exhibited recently at the National Northern Development Conference in Edmonton. Initial cost is estimated at $1.5 million.

Other fantastic claims: The vehicle is so large and powerful it can push through virgin forest, wade rivers, span arctic crevasses as wide as a highway at 35-m.p.h. speeds. It can be used as an ore carrier capable of hauling 200-ton loads; as a mobile pipe manufacturing plant and pipe-line layer; as a combined tree harvester, lumber mill, and lumber transporter.

Its dimensions: Length 125 ft., height 50 ft., width 75 ft., wheel diameter 50 ft., tire pressure 15 psi., ground clearance to underside of deck 29 ft., load deck 100-ft. long and 30-ft. wide, weight 540 tons gross and 330 tons empty, power 16 gasoline engines of 750 hp. each, four in each wheel. Engines drive 32 hydraulic pumps powering 48 hydraulic motors located at drive rack on wheel rim. Hydraulic steering is provided on all wheels.

Higher product demand expected in 1962; 3.2% over-all gain forecast

A BIG improvement in 1962 demand has been forecast by Ethyl Corp., which predicts a rise of 2.8% in domestic gasoline sales and a gain for all products of 3.2%.

The brighter prospects for next year were outlined by M. P. Murdock, Ethyl's vice president for sales, in a talk before the National Industrial Conference Board in New York.

Ethyl, after discussion with companies representing more than 75% of the refining capacity in the U. S., says total demand should rise above 10 million barrels daily. Here is the product-by-product outlook:

Gasoline sales will rise to 4,305,000 bbl. daily, up to 2.8%. This improvement will be due to better business and industrial activity. There will be more people with more cars and more money to spend.

Kerosine, 435,000 bbl. daily, up 7.4% or 30,000 bbl. daily. The switch from piston to jet engines by airplanes is not yet completed. With improved business conditions, airlines can be expected to carry more passengers and use more fuel.

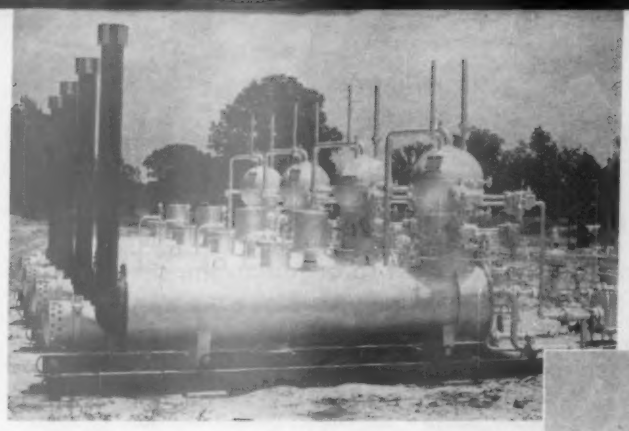
Distillates, 1,938,000 bbl. daily, up 2.0%. Improved business will mean more diesel fuel will be used by railroads, trucks, and buses.

Residuals, 1,555,000 bbl. daily, up 2.4%. The gain, in contrast to a decline this year, will be a direct reflection of an improvement in industrial activity.

Other products, 1,935,000, up 5.2%. This also will be a direct result of better business generally, particularly in the petrochemical field where many new plants now under construction will start up in 1962.

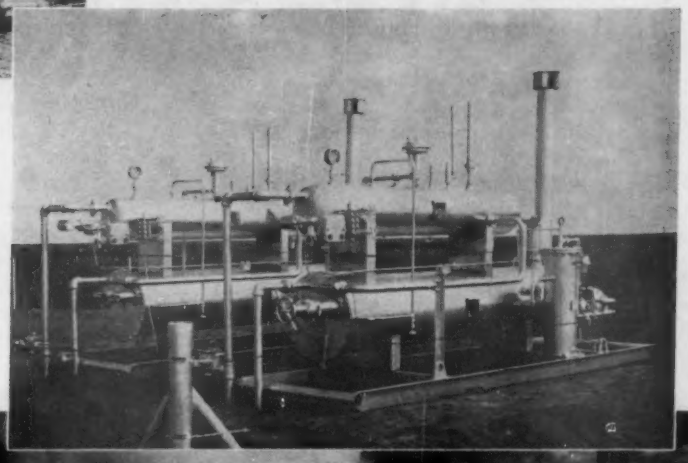
1961 prospects. Ethyl, on the basis of actual consumption during the first 7 months, plus estimates for the rest of the year, predicts demand for all products in 1961 will average 9,849,000 bbl. daily, up 1.8%.

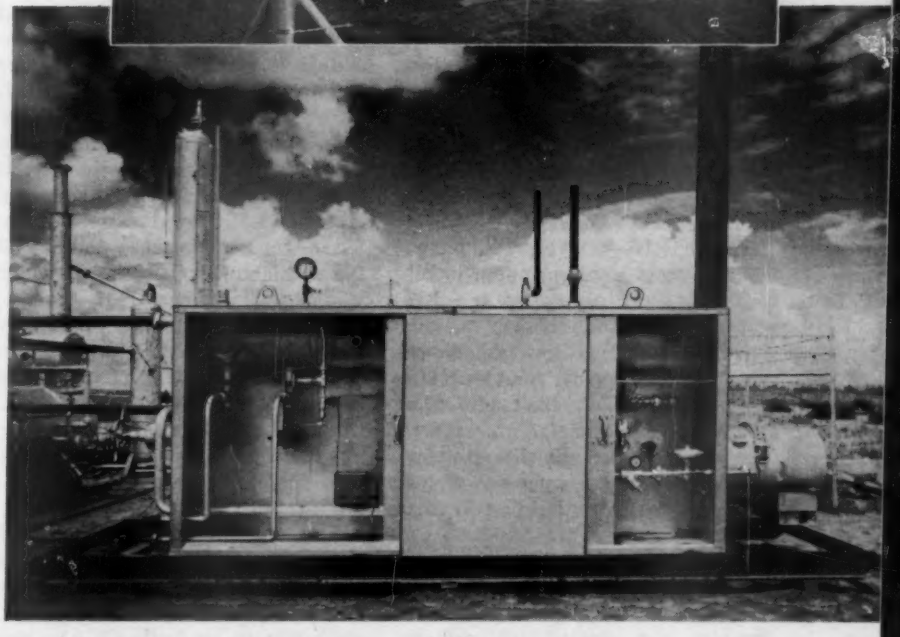
Gasoline sales will be up only 1% to 4,186,000 bbl. daily due to the advent of compact cars, the switch to jets by airlines, and generally low business activity.



Free-O-Freez

PUTS ON AN OVERCOAT





Efficient, trouble-free production in all types of weather. This is what every operator wants from his wellhead production equipment.

A few years ago BS&B went a long way toward achieving this by introducing FREE-O-FREEZ . . . a line of compact, automatic skid-mounted production units that featured immersion of the water-oil section of the separator in a hot water bath and location of controls as close as possible to the heat source.

These units have proved themselves under severe weather conditions in the Panhandle, Permian Basin, and Four Corners area.

But there are still instances where production units need to be fully protected because of extreme cold, high moisture, or blowing dust that tend to foul up controls and valving.

So now you can get FREE-O-FREEZ with an "overcoat" . . . with all the time-tested features of other FREE-O-FREEZ equipment, of course.

Ask your BS&B Salesman about FREE-O-FREEZ, or write to Black, Sivalls & Bryson, Dept. 1-A10, Box 1714, Oklahoma City, Oklahoma.

DESIGN FEATURES

- *Controls, piping, and valves completely housed, protected against cold, dust and moisture.*
- *Skid-mounted, completely piped for immediate field hook-up.*
- *Removable firebox located at opposite end from tube bundle.*
- *Tube bundle easily removed for service.*
- *Heater capacities: 250,000 BTU/hr. and higher.*
- *Available with 2 or 3 phase separators.*

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Labor activity may become major drive

• Scattered efforts to organize drilling crews and service firms are seen by some as just the beginnings of a massive effort to organize the oil industry.

THE OIL industry is bracing for a prolonged attack by organized labor.

Drilling contractors, supply and service companies—which up to now have resisted unionization—are prime targets. Pipelines, oil-industry haulers, refining and petrochemical companies, and manufacturing firms—where unions already have a foothold—will feel the effects of the stepped-up drive.

Labor experts expect the organizing effort to pick up steam this year and last through 1962.

Scattered activity to date doesn't mean much by itself. But many oil-industry labor relations people are hearing persistent reports that the early skirmishing is part of a master plan for organizing the entire industry. Reportedly back of this plan are three big national unions: Teamsters, Seafarers, and the Oil, Chemical & Atomic Workers.

The OCAW—an AFL-CIO member and most powerful union in oil today—has its sights on the big petrochemical and refining plants. OCAW's treasury is low because of recent strikes against Standard Oil Co. (Ind.), and it can't afford a lengthy drive to organize small units. The union reportedly has put its organizers through intensive training programs in preparation for the big push ahead.

What has happened so far:

1. A small, new union—the Oilfield Workers Association—has organizers out signing up drilling crewmen along the Gulf Coast. The association is working out of offices in Gretna and Morgan City, La.

2. A Teamsters local won the right to bargain for employes of a Lake Charles, La., oil-field supply store—one of four outlets in South Louisiana owned by Standard Supply Co.

3. Organizers have approached employes of three major service companies. Employes of one, in South Louisiana, have received two anonymous letters soliciting their interest in organizing an independent union. One of the letters was represented as coming from fellow workers. Employes of another service firm in Oklahoma have met at least once with a union organizer, and a union has contacted employes of a Houston-based company.

4. The Inland Boatman's Union, affiliate of the Seafarers International Union, confirms it is conducting a "continuing organizing program" in the Gulf Coast area.

The Oilfield Workers Association—if it can get bargaining rights for drilling crewmen—will push for a wage increase, job seniority, pension and hospitalization plans, and 2 weeks paid vacation. The association is headed by Andy Anderson, former Penrod Drilling Co. employe.

In a recent letter to prospective members, Anderson outlined this proposed wage scale for inland crews: $3.57 hourly for drillers, $2.58 for roughnecks, and $1.83 for roustabouts. Offshore crewmen would get 15% more.

More expected. The scattering of activity to date is significant only because of what it portends.

Even before several of the union moves, oil's grapevine was buzzing with rumors of a massive effort to organize the industry.

One said that a $3,000,000 effort was being planned jointly by the Teamsters, OCAW, and the Seafarers. This has been denied categorically by both OCAW and the marine union.

But the oil industry's labor-relations men still are convinced they are now seeing the beginnings of what will develop into a major effort.

They are concerned also about what the industry will now do about it.

Industry defense. What can an oil company, or supply or service or contracting firm do to defend itself against a massive organizing effort?

"There are lots of ways that are fair, legal, and permitted by the NLRB and current labor laws," a company labor expert says.

"The sharpest weapon we have is better communication with our employes. Management must tell its own story to its labor force. It must show its employes, at the same time, how union organizers moving in can create real problems for workmen.

"It's true, for instance, that non-union companies in an industry not fully organized do not want their employes mixing with those of a company which has been organized. This means customer companies, too. And this can hurt a union company and its employes."

"Getting your house in order," another supply-company official says, "is some of the best insurance against getting unionized. If you conduct your affairs properly, then your employes feel no need for a third party to move in."

Still another says: "Individual companies ought to do now what they would do if union organizers were knocking on their doors. You don't make a good impression on employes if you wait until that knock comes." This official adds:

PROCESSING BRIEFS

Rubber additive plant will be built in McCook, Ill., a Chicago suburb, by Universal Oil Products Co. The million pound per year plant is scheduled for completion late this year. The additive is a new chemical developed by UOP to protect rubber from deterioration caused by ozone.

Vinyl chloride monomer plant contract has been awarded by Tenneco Chemical to Crawford and Russell Inc., Stamford, Conn. The 200 million pound per year plant will be part of a new petrochemical complex to be built by Tenneco on the Houston Ship Channel.

Gas processing plant with capacity of 2,500 M.c.f.d. will be built

"An open-door policy with employes is essential. We can show that wages of our nonunionized imployes compare favorably with those of their equivalent in any union anywhere. And they have their freedom, too. They wouldn't if they belonged to a union."

Nebraska commission splits over offset to water-flood unit

THE NEBRASKA OIL and Gas Conservation Commission has split over right of a lease owner to drill a well offsetting a water-flood unit in which he declined to participate. The case has been appealed to district court.

By a 2-to-1 decision, the commission refused request of Franklin W. Baumgartner for permit to drill in Section 16, 18n-53w, Banner County, in southwestern Nebraska.

Baumgartner did not join in unitization of the J sand unit of Kenmac field, a water-flood project approved in June by the commission.

G. H. Doran and Fred J. Enders refused Baumgartner's request. They said if the well were drilled, on an offset 10 acres, efficiency of the unit would be reduced. Ray L. Smith, third commissioner, filed a dissenting opinion.

You can *DEPEND* on gas

WHETHER he knew it or not, photographer Sam Pierson of the Houston Chronicle provided the natural gas industry with a powerful piece of propaganda during Hurricane Carla. He stood in a rowboat and shot a picture of a nearly submerged gas lamp still burning.

The remarkable photo was quickly acquired by Houston Natural Gas System, the local gas utility, for use in large advertisements featuring the word "dependability."

Here are excerpts showing how Houston Natural told the story:

"The word 'dependability' has a new, personal meaning to thousands of Gulf Coast residents . . .

"Protected underground from wind and flying debris, gas lines suffered no general interruption of service."

Pierson took his picture of the dependable gas light at Channelview, east of Houston, where waters were 4 ft. deep following Hurricane Carla.

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by Continental Oil Co. in Sacatosa field in Maverick County, Texas. It will produce about 18,000 gal. daily of propane, butane, and gasoline. Completion is set for March 1962. Contractor is Delta Engineering Corp.

Polyethylene-film production of Celanese Plastics Co. will be relocated from a plant in Patterson, N. J., to expanded facilities in New Castle, Del. The transition will be completed by the first quarter of 1962.

Majority interest in J. P. Frank Chemical & Plastic Corp. has been acquired by Atlantic Refining Co. Frank Chemical, with manufacturing facilities in Brooklyn, produces polyvinylchloride resins; copolymer resins, films, and sheeting; polyethylene film; plasticizers and stabilizers.

Phthalic anyhydride plant contract has been awarded by California Oil Co. to Badger Mfg. Co. The 30 million pound per year phthalic plant will be built at Perth Amboy, N. J., with completion slated for late 1962. Design for the plant will be based on Cal Research's fixed bed process for phthalic production by oxidation of othoxylene.

Second increase in research octane number of regular gasoline within 4 months was made during September, according to Ethyl Corp.'s monthly survey of antiknock quality. Regular rose 0.1 to 92.8 RON, which is 0.3 above a year ago. Premium, at 99.2 research, was unchanged from August and 0.1 below a year ago. Motor octane was 0.1 below August and the same as September, 1960.

A 5,000-bbl. hydrotreating unit has gone on stream in the lube plant of Shell's Martinez refinery near San Francisco. The hydrotreater uses a Shell process to remove sulfur and other impurities from lube stocks. C. F. Braun & Co. was contractor on the unit.

Polyvinyl chloride plant contract has been awarded to Blaw-Knox by Cary Chemicals, Inc. The 100-million pound per year plant will be located on a 66-acre site on the Delaware River, just west of Burlington, N. J. A 50-million pound polymer plant is planned by Cary for either the Midwest or Gulf Coast areas.

Where drilling-crew wages are headed

Most Gulf Coast contractors have raised 10%, but there are several hold outs. Oklahoma companies are trying to establish a standard wage which is several cents higher than most now are paying. Trend is toward keeping 56-hour week.

DRILLING crew wages are going up, but there will be no general increase and no widespread move at this time to abandon the traditional 56-hour work week.

Mid-Continent, Southwest, and Gulf Coast area contractors have been discussing wages and hours for the past 5 months. Nearly all agree that they need to pay more to keep experienced crewmen and to attract new workers. There was an effort last month to put across a 48-hour work week (OGJ, Sept. 4, p. 91), but it is generally conceded this has fallen through for the time being.

Oklahoma contractors have set what they hope will be a uniform pay scale, and more than half of them—including some of the biggest companies—will have to come up as much as 10% to meet it. They apparently will keep the 56-hour week.

On the Gulf Coast, most contractors have raised wages 10% and stuck with the 56-hour week. But failure of some to go along with the pay hike is expected to be a hot topic at this week's Houston meeting of the American Association of Oilwell Drilling Contractors.

Shorter week. Only two companies have announced shorter work weeks.

In North Texas, Moran Drilling Co. plans to cut back to a 48-hour week for its crews with some increase in take-home pay. John Moran, head of the company and president of the AAODC, says the move will be made within the next 2 weeks. The company is looking at costs to see exactly what increase in take-home pay can be made.

In the Texas Panhandle, Baker & Taylor Drilling Co. has gone to a 45-hour week which gives crewmen 7 days off within a 5-week period plus a 5% increase in gross earnings. Hourly wages under the 56-hour week were $2.56 for drillers, $1.94 for motormen and derrickmen, and $1.84 for helpers. Hourly rates under the 45-hour system are $3.64 for drillers, $2.76 for motormen and derrickmen, and $2.62 for helpers.

In South Texas, a leading drilling contractor says several companies in that area are moving toward a 48-hour week with a 5% pay increase.

The contractor says pressure for a 6-day week has mounted because Texas drilling is getting deeper and the men need time off from long jobs.

South Texas contractors presently pay $2.86 for drillers, $2.16 for derrickmen and motormen, and $2.06 for floormen. The South Texas area is separated from the upper Gulf Coast by a line from Matagorda Bay to Hallettsville in Lavaca County.

Oklahoma pay. The new standard rate in Oklahoma is $2.86 for drillers, $2.16 for derrickmen, and $2.10 for floormen. Contractors paying less than that are supposed to raise early in October.

Oklahoma contractors aren't likely to take the lead in pushing for a shorter work week. In fact, one is going in the opposite direction.

E. A. Smith, president of Service Drilling Co., Tulsa, has offered a 12-hour day to his men who are drilling on Service leases. Crewmen on Service's contract rigs will stay on the 56-hour week.

Smith says going to an 84-hour week will amount to a 65% pay increase. And since only two crews will be needed for each rig, one-third of the workers would be available to man other rigs.

The Service executive says he won't force his men to work a 12-hour day. But if they want more money, they will have to work more.

Gulf Coast confusion. The failure of all Gulf Coast contractors to join in a 10% wage increase has caused bitter feelings in Texas and Louisiana. A Texas contractor predicts some "name calling and blood letting" at this week's AAODC meeting.

The contractor says a double standard of wages causes all sorts of problems. To cut wages after granting a raise would anger the men. Yet the contractors who granted the raise must bid for drilling jobs against those who haven't.

Right now there is a bigger spread in Gulf Coast wages than at any time in recent drilling history.

Independent jobber defends price spread

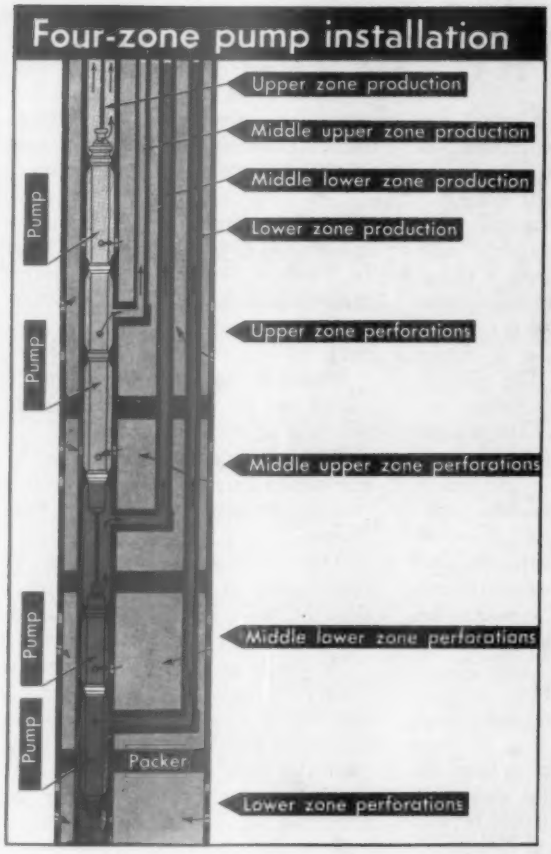
TWO sharply divergent views were expressed last week on the hottest current marketing topics—gasoline-pricing policies and margins guaranteed by suppliers to jobbers and dealers.

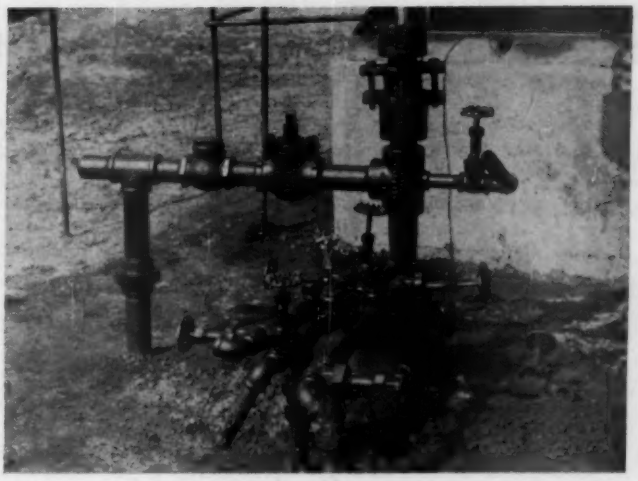
J. Arnold Jones, president of the Independent Oil Marketers Association of Indiana, said anyone who objects to private branders undercutting majors' prices is being unrealistic.

Speaking at the association's annual meeting, Jones said jobbers "may be forced" to seek marketing divorcement to avoid government regulation. He said regulation could result from marketing practices like those in Indianapolis, where a price war followed Gulf Oil Corp.'s introduction 2 months ago of a subregular priced even with private-brand regular.

R. L. Berry, general manager of Delhi-Taylor Oil Corp., told the Empire State Petroleum Association that retail chaos could be eliminated only by ending jobber and dealer subsidies. While defending a marketer's right to sell a subregular or compete at any level, he said sales should be profitable without any subsidies.

Attacking the private branders' claim to a right to undersell major brands by 2 cents, Berry suggested that no one is entitled to a differential above or below a competitor.





How one rod string replaces four

THIS Tidewater well near Duncan, Okla., holds the title for the world's first four-zone completion using a single rod string.

The four zones of the 1,795-ft. well are between 1,469 and 1,625 ft. Well produced a total of 144 bbl. of oil on its initial 24-hour test (OGJ, Aug. 7, p. 91).

Diagram shows how the well produces through the main 2-in. pumping string and three 1-in. auxiliary strings inside 7-in. casing. Pump is an Axelson-Garrett model.

Heyser favors forced pooling of drilling units

STRONG backing for new oil-conservation laws in Texas which would permit more efficient, more profitable operations came last week from Estill Heyser, Jr., outgoing president of the Texas Mid-Continent Oil & Gas Association.

One such new law, he indicated, should provide for compulsory pooling of drilling units.

Heyser, Dallas independent, gave the president's address during the forty-second annual meeting of the association in Fort Worth.

"Texas oil and gas men should reexamine the legal framework for our conservation laws with boldness and candor and see if they are modern enough to cope with contempory economic problems of Texas producers," he said.

Prejudices and narrow interests of other days, he said, must be put aside.

"We must recognize the inexorable laws of economics which dictate preferences for efficient, profitable operations compared to properties that must be developed under a system that offers limited protection to property rights and requires excessive expenditures in drilling and development."

The Texas Railroad Commission, through "wise administrative ingenuity," has been able to promote more efficient use of the state's natural resources, he added. But "the bedrock of our system must be in the law."

"Until the legislature lays a firm foundation on the statute books for it, the broad economic benefits and guarantees of property rights which can be gained through such procedures as pooling drilling units can never be fully realized in Texas.

"I hope that this association will have an open mind to any exploratory efforts which may be made in the coming months toward improving the legal procedures under which we operate."

New president. Heyser, finishing up his second term as Texas Mid-Continent president, hands the association reins this week to Clyde Tomlinson, 57-year-old Longview, Tex., independent producer (see Page 259).

Only other new officers elected were area vice presidents. Hamilton Rogers, executive vice president of Champlin Oil & Refining Co., Fort Worth, was named new North-Central Texas head. And Netum Steed, partner in Taubert and Steed, Wichita Falls independent, is new area vice president for North Texas.

Harris bill pushed. The association endorsed the Harris bill as a "satisfactory vehicle" for congressional action to free producers and gatherers of gas from utility-type control and to assure adequate supplies.

"The only possible solution" to producer problems stemming from the Supreme Court decision in the Phillips case, it resolved, "is to amend the Natural-Gas Act to exclude production and gathering of gas from its provisions."

Texas well-hookup order may get test

THE first test of the Texas Railroad Commission's historic 1958 order setting up ground rules under which pipelines must connect wells may be just around the corner.

An Abilene,Tex., independent has asked the commission to implement the directive by ordering Crown Central Pipe Line & Transportation Corp. to connect his tank batteries in Haskell County Regular field in North Texas.

The independent is B. A. Duffy. His petition for a hearing on this request has been received by the commission, but a date has not been set. If the dispute actually comes to a hearing, it will be the kickoff case under the commission order issued June 4, 1958.

Other petitions have been filed earlier, but all were settled by the contestants before the hearings could be held.

May set precedents. Due to its potential for precedent-setting action, the Duffy hearing already is arousing wide interest among producer associations.

The petition had hardly been received in commission offices in Austin when three such groups asked permission to intervene on Duffy's side.

They are the Texas Independent Producers and Royalty Owners Association, the West Central Texas Oil and Gas Association, and the North Texas Oil and Gas Association.

The Duffy case. In his petition, Duffy contends Crown Central has refused to connect his production despite its proximity to the company's receiving station at Teague.

The Duffy tank batteries, the petition claims, are between 1 and 2 miles from the Crown Central Pipe Line station. The batteries take oil from 18 Duffy wells on 10 leases. Total production is about 230,000 bbl. annually. The oil currently is trucked to the Crown Central station and sold to Crown Central Petroleum Corp., the pipeline's parent firm.

The Abilene independent contends that he has lost allowable under this arrangement, because pipeline-company agents at the receiving station refused to accept his oil except during certain hours on certain days.

Crown Central's refusal to connect, he argues, discriminates against the Duffy oil and favors its own production. It not only violates the 1958 order, he said, but also Articles 6045 and 6048 of the revised civil statutes of Texas.

Pipeline offers declined. Crown Central did not flatly refuse to extend a connection, Duffy said, but its terms were so severe as to be unacceptable.

The pipeline offered to lay a gathering system to take the oil at one time, provided Duffy would pay the estimated cost of $30,000 and own no interest in the system, he said.

Later, it offered to lay and pay for the system if Duffy paid 10 cents per barrel gathering charge until the entire estimated expenses of $25,000 were recovered.

What June order says. The commission's 1958 order (OGJ, June 16, 1958, p. 59) held that common-carrier lines must connect lease batteries on application by the producer:

Within a field when any common carrier has the only pipeline serving the field or common reservoir.

Within the general area served by a common carrier which is an affiliate or subsidiary of a common purchaser.

The order was couched by the commission in general terms intentionally, with more specific standards awaiting specific complaints.

At any hearing brought under the order, the commission would require and would consider evidence relating to the pipeline's ability to transport the type of oil involved, the market or lack of market for the tendered oil, and other factors.

Issues termed vital. TIPRO, NTOGA, and WCTOGA, in a joint petition to intervene, termed the issues at stake in the Duffy case of "vital importance to every producer and royalty owner who seeks a fair and equal opportunity to transport and market his production in this state."

The petition pointed out that it was a general action brought before the commission by the three associations and others which resulted in the 1958 order.

Kelly thinks mineral-lease law needs revamp

JOHN M. KELLY, assistant secretary of Interior, favors an overhaul of the Mineral Leasing Act governing oil and gas leasing of federal lands.

He has indicated this might include competitive bidding for unproved as well as proved areas.

Kelly says the present leasing act has a multitude of special conditions which help create a complicated, red-tape situation. He thinks simplification of the act would aid in more orderly development and procedure.

Kelly also says any major revision should include a study of the size of leases and the control of acreage limitations.

In discussing the question of competitive leasing of unproved areas, the assistant secretary said: "In many instances a small operator would have a better chance of acquiring leases through sealed bids at public sale—and possibly at a lower cost."

He points out that under present practices a major portion of noncompetitive leases go to agents or brokers who, in turn, sell them to operators.

He concedes that the competitive-bid system would reduce greatly the amount of public lands leased annually. But he has indicated that he feels the advantages of competitive bidding might outweigh any disadvantages.

He says some exceptions might

have to be made, such as in Alaska—where the government's holdings are extensive—or where the oil or gas possibilities are unknown.

Kelly's views were aired at a meeting last week of the New Mexico Landmen's Association.

Institute survey shows 1961 asphalt research spending has gone up

REFINERS in the U. S. and Canada will spend more than $4.5 million in asphalt research this year, a 12% increase over last year's cash outlay.

An Asphalt Institute survey indicates 49 member companies budgeted a total of $4,412,700 for research in 1961. Institute members account for about 75% of the total North American asphalt output and research by non-member companies was not included in the estimate.

Eight overseas affiliates of Institute members are expected to spend at least $500,000 on research this year, and the Asphalt Institute itself will spend $250,000.

The U. S.-Canada survey shows that refiners now employ 249 scientists, engineers, and laboratory technicians in asphalt research work.

"It'll cost you money, Mac . . ."

IF YOU want to interest John Q. Public in depletion, don't talk to him about a healthy oil industry and national defense. He could hardly care less.

Talk to him about his pocketbook, and he's all ears.

That's the conclusion of the Independent Petroleum Association of America, which is taking a new direction in seeking public support of 27½% depletion.

"For 13 years," says Information Director Lloyd Unsell, "I've been mailing out stock literature on depletion." The effort, says Unsell, has been met with "a thunderous silence."

Now IPAA is telling consumers that if 27½% depletion is scuttled, they'll be paying at least 4 cents a gallon more for gasoline, diesel fuel, heating oil, and other products. These figures were turned up in an association study which has been given wide circulation.

The response—from taxicab, railroad, truck, bus, farm, and equipment associations—has been unexpected, to say the least.

Editorials supporting depletion have appeared in such unlikely places as Watertown, S. D., and Kannapolis, N. C.

Reprints of the study have been requested—and distributed by—such groups as the Indiana Farm Bureau, the Farm Equipment Manufacturers Association, and the Taxicab Research Bureau.

Sun Oil Co. briefed the results of the study and included them in a brochure mailed to 300,000 credit-card holders.

And now IPAA is working on another reaction: Requests for special articles on depletion for publications of the American Truckers Association, the Kentucky Motor Transport Association, the Texas Trucking Association, and other groups wanting further material.

IPAA has had to call on public-relations men with oil companies to help meet the demand for material.

"We talked for years about the need for a healthy domestic oil industry, and nobody seemed to care," Unsell says. "Now we're telling them that a cut in depletion is going to cost them money, and they're really getting interested."

FTC lacks flexibility, new member declares

EVERETTE MACINTYRE, who was sworn in last week as a member of the Federal Trade Commission, thinks the FTC should act more like Congress and less like a court.

That is, he believes it should pass rules—within the broad framework of existing congressional legislation—that would apply to an entire industry.

As it is now, the agency proceeds on a case-by-case basis in the manner of a court.

MacIntyre does not advocate abandonment of the case-by-case procedure. But he feels the industry-wide approach should be a supplementary weapon to be used when the agency believes an unfair trade practice is being widely employed throughout an industry.

He feels this would help eliminate the "regulatory lag" at the agency.

MacIntyre points out that the FTC already exercises quasijudicial power, but says this isn't enough.

"I am convinced that our quasi-judicial proceedings alone will not permit us to discharge our responsibilities," he adds. "The use of unfair acts and practices is on the increase and the commission has fallen years behind in its effort to meet this challenge."

MacIntyre, who for years was a staff man at the agency, feels that FTC has the authority to act as "an arm of Congress."

He says that if the commission majority and the courts should conclude that Congress has not provided for this, "then the problem should be placed before Congress without delay."

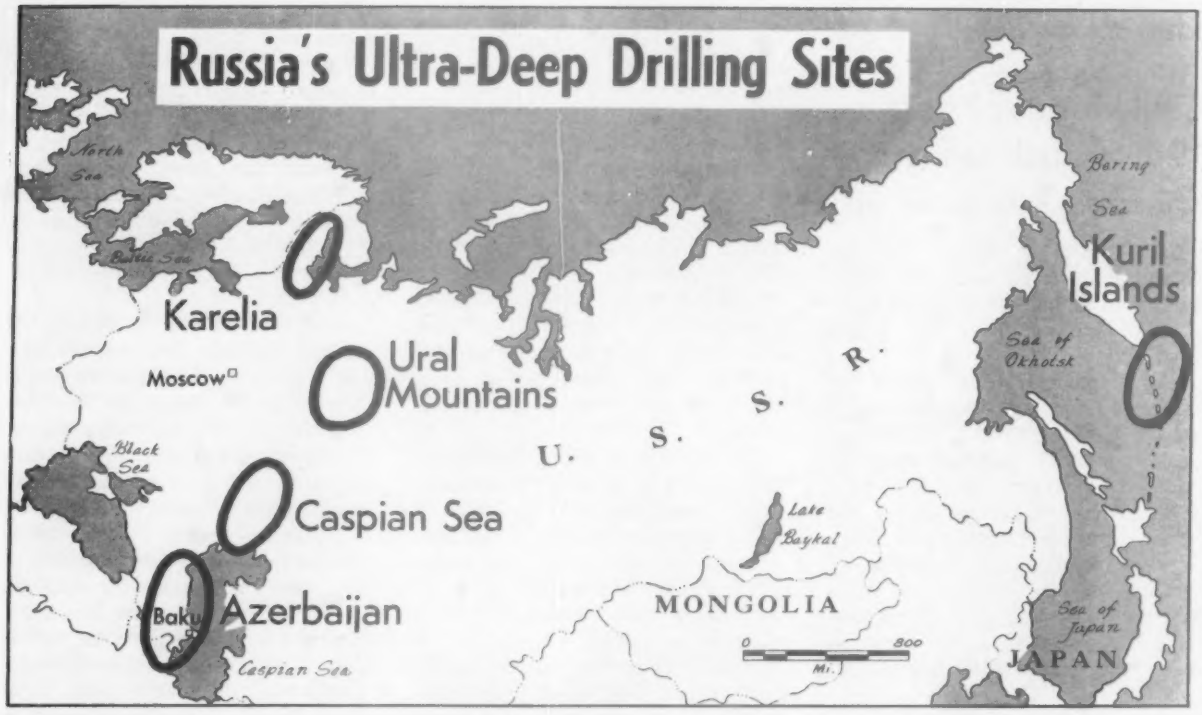
The MacIntyre approach envisions broad FTC economic studies of practices and conditions in industry and commerce. This would set the stage for the quasilegislative action that would follow when needed.

He says the FTC already has the "unique legal tool" for making such studies.

MacIntyre is the third appointee by President Kennedy to the five-man commission. The others are Chairman Rand Dixon and Commissioner Phillip Elman.

MacIntyre, a Democrat, was an attorney with the FTC from 1930 to 1955, and was particularly active in antimonopoly work. Shortly after World War II, he organized the FTC's antitrust trial staff of about 40 men.

In 1955 he became a staff member of the House Small Business Committee.



Soviets plan five Mohole-type tests

Drilling won't start anytime soon because the Russians don't have equipment or know-how to reach the projected depths of 33,000 to 49,000 ft. Incentive to develop deep drilling: Much of Russia's oil and gas lies below 13,000 ft.

RUSSIA is seriously planning its Mohole program.

The project will consist of an attemp to drill five super-deep tests in the 10-km.-to-15-km. range or roughly 33,000 to 49,000 ft.

The holes, if drilled, will be in widely separated regions of the USSR. Two of them, in the oil producing regions of the Caspian Sea, will be of special interest to oil geologists the world over.

Planning for the program is being carried out by the Collegium of the USSR's Ministry of Geological Survey and Conservation of Mineral Resources. Soviet geologists, geophysicists, and mining experts have already reported to the Collegium on sites and drilling methods.

One Russian expert predicts that even deeper wells are in the offing. He is Prof. Y. Kravtsov, who said in a report to the Collegium that soviet technology is "making it possible to carry out even more daring projects: To sink shafts up to 20 km. (65,000 ft.) deep."

The proposed super-deep wells are being compared in importance with soviet space-exploration efforts. The Russians are emphasizing the program is not a "stunt."

The first five holes will be designed to drill through a cross section of all types of rock in the earth's crust—sedimentary, granite, and basalt. Tentative locations and objectives of the wells are:

Caspian. A well, apparently near the northern shore of the Caspian Sea, will "pierce the thickest layers of sedimentary rock in the world." The hole will reach the continental base at the depth of 12-14 km. (39,370-45,930 ft.). It will help determine the lower limit of oil occurrences "and may yield information about new deposits which have hitherto been inaccessible," the Russians say.

Azerbaijan. A site in the old Baku region west of the Caspian, formerly Russia's most important oil producing area, was chosen for a study of basalts. The soviets say the test will help answer questions such as: "How do heated steam solutions deposit veins of metal? How did the crust become separated into granite and basalt layers? How do elements travel from the depths to the surface?"

Karelia. A 15-km. hole (49,215 ft.) in Karelia, east of Finland, will pass through granites believed to be more than 3.5 billion years old. Russian scientists are hopeful the bore will help solve such geological problems as the origin of continents and the development of the magmatic layer.

Urals. A well drilled to the base of the Ural Mountain range will have as its objective a clearer understanding of the origin of the Urals' rich copper deposits. The soviets say that "since this hole will probably pass through ancient magmatic centers, the mystery of how molten subterranean seas came into being will be a step nearer solution."

Kuril Islands. A test in the Pacific-island chain south of Kamchatka Peninsula will be projected to the Mohorovic Discontinuity, below which soviet geologists say they hope to obtain "particles of unknown subcrust matter." Russian scientists claim the thinnest part of the earth's crust is in the volcanic area of the islands.

Expect problems. The Soviets concede that plans may have to be altered because of unforeseen difficulties, and point out that technical problems involved in deep drilling should not be underestimated. Western oilmen will undoubtedly concur in this, especially in light of the known status of deep drilling in Russia, and the shortcomings of soviet gear.

A Russian, I. Vainer, chief specialist in the Oil & Gas Industry Section of the State Planning Committee, has detailed some of the weaknesses of local equipment. He cites as examples:

"The Uralmash-3D and 4E rigs are supposed to drill wells to 5,000 m. However, such units as pumps, rotor, and swivel do not insure uninterrupted work below 3,500-4,000 m.

"When working with a turbodrill below 3,500 m. U8-3 pumps cannot deliver the necessary amount of fluid at high pressure."

Vainer also cites production lags: A new 200-ton rig was to have been placed in production last year. "But after building two such rigs, both of low quality, the factory rested at ease.

"Quantity production of new U8-4 pumps is expected this fall, 11 years after design work began. Design work on more modern U8-6 pumps was started 3 years ago. First test models were produced in April 1960. Commercial production has not yet started."

He sums up by saying: "The main obstacle in reaching deep oil and gas deposits is the lack of modern equipment and tools that will stand up under high pressure—pumps, high strength pipe, sturdy bits, tackle systems, hydraulic brakes, swivels and sleeves."

The Russians, however, have an incentive to develop gear that will stand up under deep drilling. Vainer says that soviet geologists estimate over 30% of the country's predicted oil deposits and about 60% of its gas are in Mesozoic deposits, a considerable portion of which lie at depths between 4,000-10,000 m.

Extensive work has already been done on improved gear. Last year, the All Union Scientific Research Institute for Drilling Technology announced preparations for a 10-km. well to be drilled with a newly-designed diamond bit, a new light-alloy drill pipe "three times lighter than steel," and improved muds and cements.

While Western oilmen might be skeptical about the near-term prospects of the 32,000-ft. well, as well as the whole Mohole program, they might hedge before saying it can't be done. The memory of flights by astronauts is too fresh.

Canadian firm gets Indonesian rights

A CANADIAN independent and an Indonesian Government oil company have joined forces for an exploration and development deal on a large acreage block in North Sumatra.

Asamera Oil Corp., of Calgary, has reached an agreement on the program with Permina, a national oil company wholly owned by the Indonesian Government. Work on the project, which has been under negotiation for several years, will probably start within 90 days.

Profits will be split on a 60-40 basis, with Asamera taking the smaller half. This will be done under the provisions of the new Indonesian oil regulations which govern the agreement with the Canadian company.

Asamera will supply capital, technical assistance, and equipment—for which it will be reimbursed. The company does not have a concession as such, which is prohibited by the new rules. But it is working under provisions which permit the state to enter into agreement with foreign firms in cases where the country's technical or financial resources are inadequate.

Tom Brook, president of Asamera, said: "This is three times as good a deal as I could get in Alberta." He estimated that "at least" 750,000 acres in North Sumatra will be included in the block.

The agreement is the second made by Permina with a foreign company in North Sumatra. Japan Petroleum Exploration Co., a semigovernment comporation, has a joint development program in progress under which Japan Petroleum will receive a minimum of 12,000 bbl. daily of crude for at least 10 years. Permina is now producing about 17,500 bbl. daily.

One Venezuelan state stops foreign firms from building outlets

VENEZUELAN Petroleum Corp., the new national oil company which is supposed to compete equally with private firms, is getting preferential treatment from the Miranda State government.

The state of Miranda, at the request of its legislature, has announced it will no longer issue permits to foreign companies to build service stations. The reason, according to one deputy, is to reserve a few choice locations for the new national company.

Venezuelan Oil, meanwhile, at last reports still had not sold any crude from its two wells in Lake Maracaibo. The wells, which are shut in, are rated by the government at a combined capacity of 12,000 bbl. daily.

The Ministry of Mines has said it is considering offers for the crude from several countries. But it is determined to maintain crude price.

Work rushed on line to reverse Edjele flow

Political strife is keeping normal outlet shut down. So CREPS is building $3-million, 29-mile branch line from idle system to new Ohanet pipeline.

THERE'S nothing like the sight of shut-in oil fields to make a grown oil man cry, especially if he's a Frenchman and newly proud of his oil-finding prowess.

The French think they have shed enough tears of this type and they are going to spend $3 million to correct the situation.

CREPS, the French company in which Royal Dutch-Shell has a 35% interest, last week set the wheels in motion for a crash program of pipeline construction to get its Edjele-Zarzaitine complex of fields back in production. CREPS will lay 29 miles of 24-in. pipe deep in the Sahara Desert to reverse the normal flow from these fields.

The main 24-in. trunk pipeline, which normally moves as much as 186,000 bbl. daily from these fields, is still shut down by the political quarrel between France and Tunisia over the Bizerte naval base.

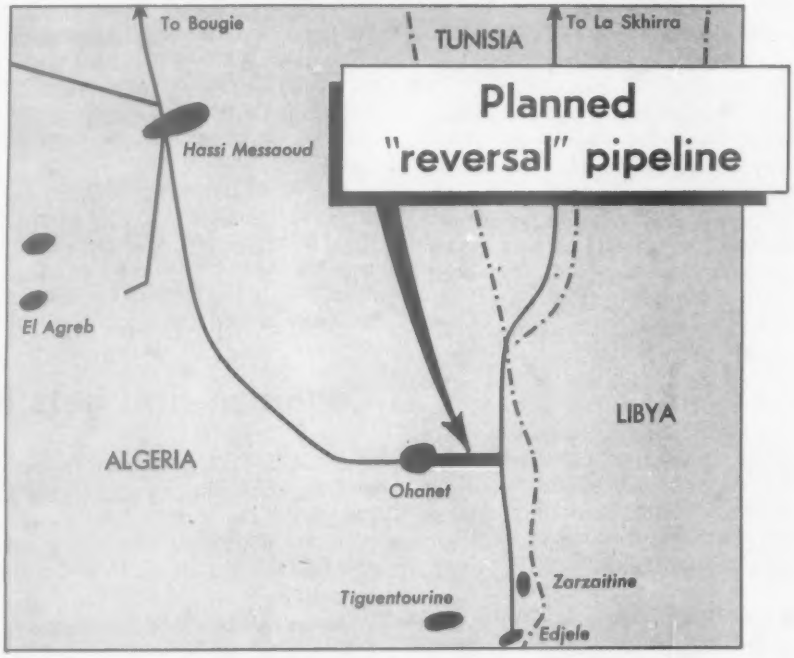
CREPS will tap the shut-down In Amenas-La Skhirra system with a new 24-in. branch line and divert the flow from the Edjele area into the newly completed 30-in. Ohanet-Hassi Messaoud line which only went in operation early this month (OGJ, Sept. 11, p. 100).

This will allow about 60,000 bbl. daily of Edjele crude to move to the Mediterranean the "long way" via Hassi Messaoud to Bougie through the first 24-in. pipeline built to serve other fields.

The pipe needed for the project is being manufactured in France under a high-priority program with delivery date scheduled for October 15 at the latest. Pipe is slated to be laid down north of the In Amenas pipeline terminal.

The short branch line is expected to be in operation by Christmas.

The CREPS decision came last week after repeated denials by French Government agencies that such a move was planned. Paris sources point out that the pipeline will be financed entirely by CREPS. The French Government, in spite of the fact it owns 65% interest in the company, is maintaining a hands-off attitude officially in order to avoid antagonizing Tunisia's President Habib Bourguiba any further.



The Tunisians shut down the 24-in. Edjele outlet at the La Skhirra terminal when the fighting over the Bizerte base broke out July 21. Since that time President Charles de Gaulle of France has said publicly that Bourguiba has designs on Edjele himself.

Suffering losses estimated at $400,000 a day with the producing fields idle, CREPS apparently decided the $3-million pipeline investment is a good one while the politicians make up their minds about the future of the 24-in. pipeline.

There was widespread speculation at the time the Ohanet-Hassi Messaoud line was started early this year that the French would eventually link the two producing areas anyway to forestall just what has happened (OGJ, Jan. 23, p. 62).

The political crisis which shut down one of the two 24-in. outlets for Saharan crude came before the two areas could be linked. The link will still mean that the Edjele-area fields can produce at only about one-third capacity.

CREPS has a lot at stake in the area. The company's Edjele discovery was the first major oil field in the Sahara and this field, plus other similar shallow producing fields in

FOREIGN BRIEFS

A new Iranian wildcat has been spudded at Khalafabad, 15 miles northwest of the prolific Agha Jari field, by Iranian Oil Exploration & Producing Co., operator for the consortium. The well, KD-1 was started September 8.

Refining rights for a 12-year period have been granted by the Dominican Republic to Thomas A. Pappas and Associates of Boston. Pappas reportedly plans a plant of from 10,000 to 15,000 bbl., which will supply local markets with products.

Construction contract for a 70,000-bbl. refinery near Durban, South Africa has been awarded to Foster Wheeler, London, by South African Petroleum Refineries, a

the same area, have proved to be better than the bigger, deeper Hassi Messaoud discovery. In addition to the Edjele fields, CREPS is offsetting Ohanet field to the south.

Cie. d'Exploration Petroliere (CEP), in which Mobil International has a 25% interest, has drilled 21 wells at Ohanet and plans an even 30 producers to move about 24,000 bbl. daily into the new 30-in. pipeline.

By next year, CREPS plans to add at least another 6,000 bbl. daily to that flow from the southern extension of the field on its own acreage. CREPS has already drilled 8 producers on what it calls South Ohanet.

The new 24-in. section of pipeline, plus the 321 miles of 30-in., will give the Sahara's "U-shaped" pipeline system a heavy bulge at the bend. But at the rate fields in the southern Sahara are being developed, the French may have to start looping either or both of those 24-in. trunk lines. It is doubtful they will loop the 24-in. that passes through Tunisia, however, until things become much more stable politically.

Local firm to build Thailand refinery

AFTER YEARS of dickering with an assortment of foreign companies, Thailand has at last signed an agreement for a 40,000-bbl. refinery to be built by a local company backed by Shell, Stanvac, and Caltex.

The $35-million project will be built near Sriricha, on the Gulf of Siam, 90 miles east of Bangkok, by Thai Oil Refinery.

Shell has a crude-supply and products - purchase agreement with Thai Oil.

The refinery is scheduled to go into operation in 2 years.

Thai Oil will pay 25% of the profits to the government, and the plant will be turned over to the government after 10 years.

The contract leaves in doubt the fate of another refining offer made by Summit Industrial Corp., backed by Phillips Petroleum. Summit's bid to build a 30,000-bbl. plant has been approved, but the agreement has not actually been signed.

Existing markets in the country make it doubtful whether two refineries at the present time would be feasible. Inland demand is about 33,000 bbl. daily at present, while 1,000 bbl. daily is sold as bunkers.

Indiana Standard reached an agreement 2 years ago to build a 25,000-bbl. plant, but backed off over the government's terms for the turnback.

Aramco puts finishing touches on refrigerated LPG tanker terminal

FIRST refrigerated LPG facilities in the Middle East have gone on stream at Ras Tanura, Saudi Arabia.

The $7.5 million project will enable Arabian American Oil Co. to produce a total of 4,000 bbl. daily of propane and butane for tanker shipment.

LPG from Aramco's 189,000-bbl. Ras Tanura refinery is delivered via 6-in. pipelines to the terminal for refrigeration and storage in three tanks. Propane and butane are segregated each step of the way, and offtakers can pick up either butane, propane, or a combination.

Butane is stored at 0° F. and propane at —43° F. Mixtures are stored at temperatures from zero down to —15° F., depending on composition. Each storage tank has heating elements in the foundation to prevent the ground from freezing and heaving. The butane tank has an internal floating roof to allow for temperature changes that take place before blending with propane for mixed shipments.

Insulated loading and return lines on the pier allow cold LPG to be circulated continuously and keep the line cold.

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joint British Petroleum-Shell company. The plant is scheduled to go on stream early in 1964 at Reunion Rocks.

Big-volume gasoline outlets are becoming more common in Venezuela. Mobil has 20 stations selling better than 1 million gallons a year each only 4 years after entering Venezuela's market. Mobil's latest million-a-year station, opened 17 months ago, is selling an average of 190,210 gal. monthly from 14-pump, 4-bay facilities on Caracas' busy Andres Bello Avenue.

Concession rights covering 37 million acres in Somalia now held by Frobisher, Ltd., of Toronto are being sought by Gulf Oil. Frobisher acquired rights in 1959 on about 47 million acres in the southern part of the East African country. Some 9 million acres of the original concession have been assigned to Sinclair Somal.

A wildcat has been started by Pakistan Shell on a new structure 10 miles east of Sylhet, East Pakistan. Kailas Tila 1 is projected to 13,000 ft. Shell found gas in the area last year in its Rasidpur 1 test.

Acquisition of 35% interest in Furukawa Chemical Co., Tokyo, was announced by Indiana Standard. The Japanese firm produces 20 million pounds annually of polyethylene and copolymers under an Indiana Standard license.

A third wildcat test on Phillips-Sunray acreage blocks in Queensland, Australia, will be spudded this week. The 1 Etonvale, about 130 miles north and east of Quilpie, is projected for 10,000 ft. The other recent Phillips - Sunray tests were dry. The 1 Buckabie, 36 miles north of Quilpie, went to 9,000 ft., and the 1 Cothalow, 50 miles north, was abandoned at 6,000 ft. Phillips is operator.

Mobil's third wildcat on its Lake Maracaibo, Venezuela, farmout has been abandoned as a dry hole. The well, MOB 347.1, was taken to 12,424 ft. It is 2 miles north-northeast of a 3,860-bbl.-daily well brought in on the second try.

An Isocracker will be added to the 40,000-bbl.-daily refinery under construction by Caltex Oil (Germany) at Frankfurt. Process design engineering on the 6,450-bbl. gas-oil cracking facility is being done by Calresearch.

World flow declines

July crude output fell by 422,000 bbl. daily. Producers in Persian Gulf area took brunt of reduction.

FREE-WORLD crude production slipped 422,000 bbl. daily in July due to declines in the Middle East, North Africa, and the U. S.

Persian Gulf producers took the brunt of the reduction with lower levels of output in Iran, Saudi Arabia, and Kuwait.

The CREPS pipeline from the Edjele area in the French Sahara to Tunisia was cut off during the last few days in the month, partially accounting for an over-all decline of 57,800 bbl. daily in the area.

The impact of crude from the Japanese-controlled Khafji offshore oil field has enabled the Neutral Zone to replace Qatar as the fifth-ranking crude-producing area in the Middle East. Khafji output during the month rose another notch to 27,900 bbl. daily.

TREND OVER THE LAST YEAR
(Thousands of barrels)

	Western Hemisphere less U. S.	Middle East	Total free world outside U. S.
1960			
July	4,210.7	5,102.7	10,454.1
August	4,420.1	5,146.8	10,620.5
September	4,311.3	5,500.2	10,941.3
October	4,243.9	5,630.2	11,104.5
November	4,206.8	5,482.2	10,964.2
December	4,341.2	5,550.1	11,152.2
1961			
January	4,594.1	5,568.1	11,418.8
February	4,616.9	5,697.7	11,572.8
March	4,448.6	5,764.1	11,510.1
April	4,287.9	5,558.7	11,151.7
May	4,395.3	5,519.6	11,271.3
June	4,436.3	5,750.1	11,575.1
July	4,454.1	5,517.4	11,297.9

World-Wide Crude Production: Daily average in thousands of barrels

Country—	July 1961	June 1961	July 1960
Western Hemisphere			
Argentina	230.5	230.5	168.4
Bolivia	7.6	7.6	8.7
Brazil	95.0	95.0	73.8
Canada	625.1	612.0	521.0
Chile	26.9	24.1	19.0
Colombia	144.1	145.2	155.9
Cuba	0.2	0.2	0.2
Ecuador	8.3	8.3	7.1
Mexico	286.1	286.1	279.8
Peru	51.0	51.0	53.2
Trinidad	123.1	123.1	68.5
Venezuela	2,856.2	2,853.2	2,855.1
Total	4,454.1	4,436.3	4,210.7
Europe			
Austria	44.7	44.7	45.8
France	41.4	41.0	39.7
West Germany	121.3	120.3	108.0
Italy	43.8	35.6	41.8
Netherlands	37.4	38.6	36.6
United Kingdom	1.7	1.7	1.7
Yugoslavia	27.4	27.4	19.5
Total	317.7	309.3	293.1
Middle East			
Bahrain	45.0	45.0	45.1
Iran*	1,196.0	1,222.0	950.0
Iraq†	999.9	986.7	895.0
Israel	2.3	2.3	2.5
Kuwait	1,619.0	1,738.3	1,700.2
Neutral Zone‡	187.8	162.1	130.6
Qatar	179.5	174.3	174.2
Saudi Arabia	1,280.9	1,412.4	1,198.1
Turkey	7.0	7.0	7.0
Total	5,517.4	5,750.1	5,102.7

Country—	July 1961	June 1961	July 1960
Other Asia			
British Borneo	90.0	90.0	90.1
Burma	10.5	10.5	12.3
India	8.5	8.5	8.5
Indonesia	440.3	453.4	421.4
Japan	13.5	13.2	10.1
New Guinea	3.1	3.1	4.5
Pakistan	5.9	5.9	5.9
Total	571.8	584.6	552.8
Africa			
Algeria	320.7	378.5	195.1
Angola	1.5	1.5	1.5
Egypt	71.7	71.7	60.1
Middle Congo	14.7	2.0	.....
Gabon	2.0	14.8	16.8
Morocco	1.7	1.7	2.0
Nigeria	24.6	24.6	19.3
Total	436.9	494.8	294.8
Free world			
Foreign	11,297.9	11,575.1	10,454.1
United States	6,958.0	7,102.8	6,859.5
Total	18,255.9	18,677.9	17,313.6
Communist Countries in Soviet Orbit			
Romania	234.0	234.0	231.0
Russia	3,260.0	3,260.0	3,027.0
Other Communist	100.0	100.0	100.0
Total	3,594.0	3,594.0	3,358.0
WORLD TOTAL	21,849.9	22,271.9	20,671.6

Figures are from reliable industry reports or government sources. Estimates are made where complete reports are lacking. *Includes estimated 6,000 bbl. daily from Naft-i-shah field not operated by consortium companies. †Includes production from Naft Khaneh field, operated by Iraq Government. ‡Includes offshore production by the Japanese-based Arabian Oil Co.

OIL AND GAS JOURNAL

HOW TO GET YOUR MONEY'S WORTH FROM DRILL COLLARS

By H. M. "Moak" Rollins

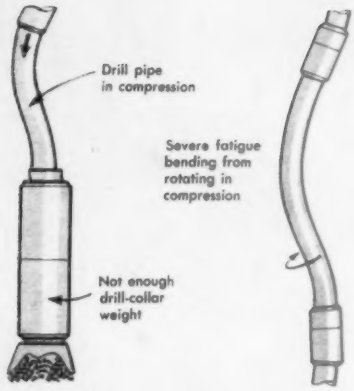
... a special section

This material on drill-collar selection, operation, and care is the most comprehensive ever published, to our knowledge. If you read this section and operate by the principles it sets forth, you are virtually certain to cut drill-collar cost.

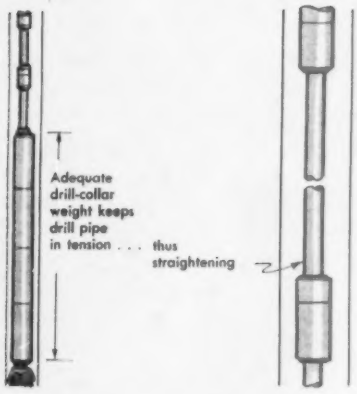
First, attention is devoted to the basic reasons drill collars fail. Then four ways to avoid such problems are outlined: (1) better design; (2) better machine-shop practice; (3) better rig practice; and (4) systematic inspection and maintenance at the rig.

The author is engineering manager for Drilco Oil Tools, Inc., Midland, Tex. Rollins combines in this section years of field experience, shop operation, and research and development on drill collars.

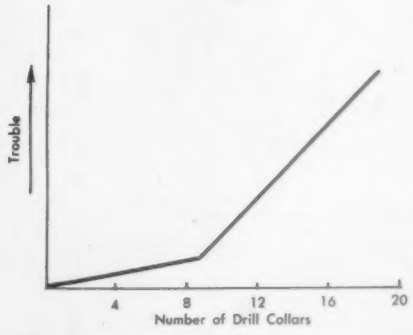
Why drill collars are used and why they sometimes fail



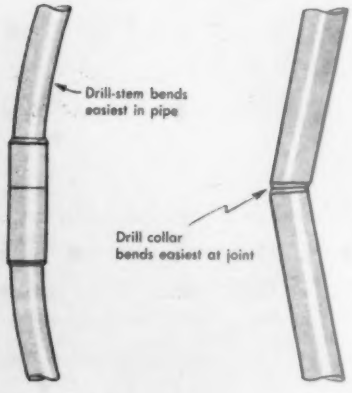
ALL WEIGHT on bit must be drill-collar weight; otherwise, the drill pipe runs in compression. Result is severe bending and early fatigue failure of the pipe. Also, when pipe is in compression, outside surfaces of tool joints wear away quickly. Fig. 1.



WITH PLENTY of drill collars, the drill pipe runs in tension so that it remains relatively straight and suffers fewer fatigue failures. Expense and trouble in handling collar strings are more than offset by reduction of failures and fishing jobs. Fig. 2.



TROUBLE multiplies rapidly as number of collars increases past seven or eight. Only way to counteract this trend is to train the rig crews in proper care and operation of long collar strings. Good rig practice means thousands of hours of failure-free operation. Fig. 3.



DRILL COLLARS bend in joints since the joints are naturally the weakest points; the same is not true in drill pipe where tool joints are more rigid than body of pipe. As a result, the same joint which is trouble free on drill pipe may fail in collar service. Fig. 4.

IN ANY DISCUSSION of drill collars, we find people who wonder why we need take the trouble to handle collars in the first place. Drill collars are heavy, they are awkward to handle, and it would be much simpler working around a drilling rig if no drill collars had to be run. Fig. 1 shows the basic reason drill collars are required. The rock bit must have enough weight to penetrate the formations being drilled.

With too little weight in the drill-collar string, it is necessary to put on additional weight by running the drill pipe in compression. When drill pipe is run in compression, it bends severely. Result will be fatigue failures. Moreover, the body of the drill pipe will wear rapidly near the center of the joint. Outside surface of the tool joints will wear away quickly and often the wall of the hole or the inside of the casing is scrubbed badly by the tool joints.

Fig. 2 shows the opposite case, where drill-collar weight is adequate to supply all the load needed on the bit, and still keep the drill pipe in tension. The drill pipe remains relatively straight so it does not bend severely as it rotates. Because it does not bend, there will be fewer fatigue failures and a slower wear rate in the drill pipe.

In areas where rigs run relatively low bit weight and short strings of drill collars (in the range of three to six), there is little trouble with collar joints. As the rigs begin to run heavier weights, they find it necessary to use more collars. The amount of collar trouble increases severely after the rigs begin to use more than seven or eight, Fig. 3. This trouble increases proportionally in the longer string of drill collars unless rig operators have been trained in proper operation. With good care of collars and the right rig procedures, long strings of collars operate many thousands of hours without difficulty.

Same joint, different bend. You may ask "Why do we have trouble with drill-collar joints when these same threads in tool joints on drill pipe give no trouble"? Basic reason is that most failures in drill-stem members are fatigue failures. Fatigue failures occur at the point where bending is concentrated. In the drill-pipe assembly, the pipe wall is much thinner than the tool joint, and is more easily bent. Therefore, most of the bending takes place in the pipe and not in the tool joint, and most of the failures take place in the pipe and not in the tool joints.

In drill collars, this is not true; most of the bending must take place in the joint, Fig. 4. The joints are machined integrally in the drill-collar material and are necessarily the weakest part of the assembly. Since

most of the bending takes place in the joint, most of the failures occur at the joint.

The thing to remember is that drill collars **do** bend while rotating in the hole, Fig. 5. You may look at a single 8-in. drill collar on the rack and think it so heavy and stiff it cannot bend. Yet, when three of these are in a stand in the derrick, you very definitely can see them bending and whipping in the wind. Consider that you sometimes stack 20 to 30 of these drill collars one on top of the other in the hole. You get a very long and limber column which must bend when placed in compression.

Bending extends cracks. Any member which is bent assumes the form shown at the top of Fig. 6. The fibers on the outer side of the bend are in tension. Fibers on the inner side of the bend are in compression. If we rotate this member one-half turn, the fibers that had been in tension are now in compression. Those that were in compression are now in tension as in the bottom of Fig. 6. In every drill pipe and drill collar rotated in the hole, we have this continual movement from tension to compression and back to tension in every rotation of the drill stem.

If there is a crack in the surface of any drill-stem member, every time this crack comes to the tension side of the bend it wants to grow or increase in size. This gradual and continual growth of cracks which originate on surfaces of bending members, we call fatigue-crack growth.

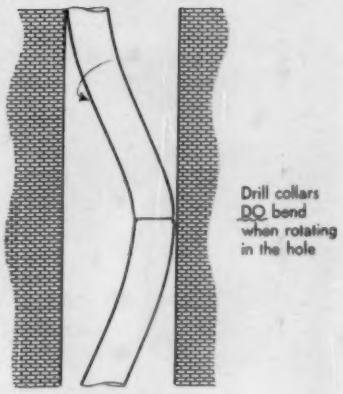
Fatigue cracks originate at the areas where stress is concentrated, where bending stress is highest. In a drill collar, there are two areas shown in Fig. 7 where stress concentration is most important. These are easy to spot if you understand joint mechanics. When the drill-collar joint is properly made up and assembled, the shoulders support the pin so it is rigidly held by the box-thread members. Then, the weakest section is the narrow cross-section in the bottom of the box near the end of the pin. This is one area in which we have many box-thread fatigue failures in hard-rock-drilling country.

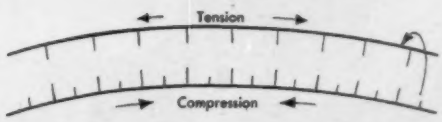
The other area where we have many failures is in the first or second thread near the base of the pin. If the joints are not properly made up, the shoulders do not adequately support the pin in bending. If the shoulders are too narrow, they cannot support the bending load imposed by the pin. In either case, severe bending stresses concentrate in the first and second threads near the base of the pin. Result is fatigue cracks which originate between treads in this stress-concentration area at the base of the pin.

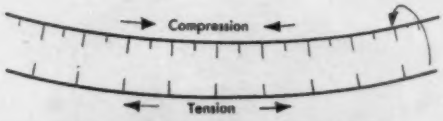
Same as notched wire. Fig. 8 is an illustration of stress concentration in bending-fatigue failures. Consider the method by which one breaks a piece of baling wire. If you hold a piece of baling wire 6 or 8 in. apart in your two hands, you can bend it back and forth all day without breaking it. If you want to break it quickly, you grasp it with a pair of pliers or in a vise, and bend it back and forth at the point where you grip it. This way you produce a failure after some 20 or 30 bends.

If you want to bend it and break it in a hurry, you notch it with the pliers, or with a file. Then, if

MAKE no mistake about it: drill collars do bend while rotating in the hole. When 20 or 30 collars are stacked atop each other, the column is long and relatively limber. Resultant bending is what propagates cracks in the collar joints. Fig. 5.

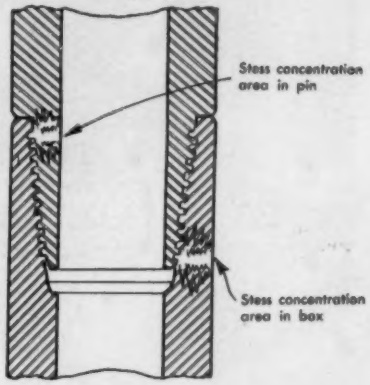


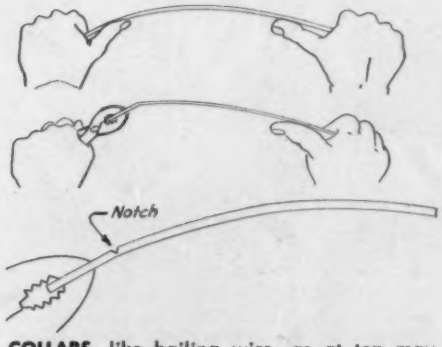




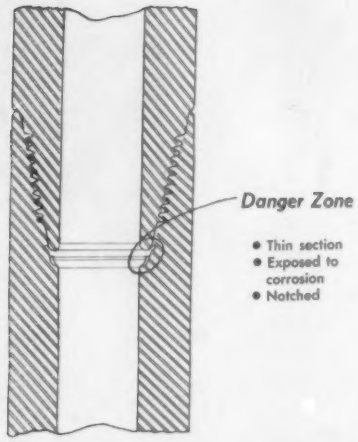
CONTINUOUS OPENING AND CLOSING of cracks results as the collar rotates in the hole; area of the crack passes from tension to compression and back to tension in each rotation. Crack grows and, if undetected, leads to failure while drilling. Fig. 6.

MOST collar failures occur at the two areas shown here. Reason is that these are the areas where stress is concentrated. When joint is made up right, weakest point is in the bottom of the box; with poor makeup, failure often occurs near base of pin. Fig. 7.



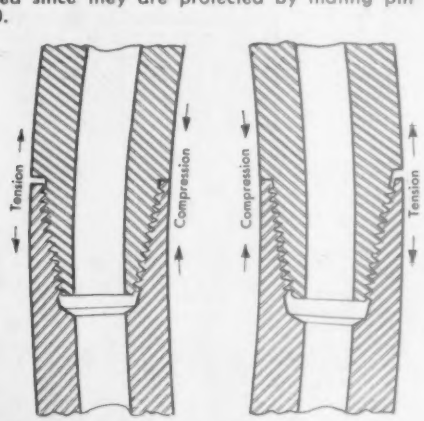


COLLARS, like bailing wire, as at top may be bent many times without breaking. At middle, pliers bend wire in short radius so it soon breaks. Fastest break comes with notch in wire. Crack in drill collar is same as notch in wire. Fig. 8.



BOTTOM of box at end of pin may be compared to the condition of the notched wire. This area of the drill-collar joint is thin compared to the heavy sections adjacent; threads act like notches; and corrosion from mud induces pits and cracking. Fig. 9.

BOTTOM-OF-BOX FAILURE shown here is typical of those in box threads near the end of the pin. Three threads at bottom are pitted and corroded; remaining threads are undamaged since they are protected by mating pin threads. Fig. 10.



TOO LITTLE MAKEUP means there is too little compression in shoulder. As a result, the shoulder on the tension side opens up, allowing mud to squirt through. When pulled, pin is dry and area around shoulder is dull gray color. Fig. 11.

you grasp it at the notch and bend it back and forth three or four times, the wire breaks. You produced a fatigue failure in the wire at the notch, and you produced it rapidly because concentration of stress at the bottom of the notch is high.

We can compare this wire-breaking notch to the cross-section we have in the drill collar in the bottom of the box at the end of the pin. As Fig. 9 shows, we have a thin section adjacent to a very heavy section where the two members are screwed together. The heavy section acts, in this case, like the vise or a pair of pliers. In the thin section we have a notch in the thread itself.

This notch is exposed to corrosion from the drilling fluid which works against this surface. Every corrosion pit quickly becomes a very sharp scratch or notch in the bottom of the thread. Under these circumstances, we can produce very rapid fatigue failures in the threads at the bottom of the box near the end of the pin.

Fig. 10 is a typical fatigue failure at this location. Notice on the inside of the box there are three threads at the bottom which are rusty and pitted by severe corrosion. The other threads are bright and shiny. These clean threads are protected from corrosion by the mating pin threads. The crack began from the inside of the box in one of the unengaged threads at the bottom of the box; it progressed very slowly almost across the entire section of the box. Finally when the driller picked up off bottom, not enough strength remained to support the load, so it broke.

Not enough makeup. Only when there has been proper makeup control on the drill-collar joint will fatigue failures occur first in the bottom of the box. When makeup control in the drill collar joint is poor, failures occur at other points. Fig. 11 shows what happens when a drill-collar joint has not been properly tightened. As the collar above the joint bends back and forth, the pin bends back and forth. If there is too little compression in the drill-collar joint shoulder, it cannot remain tight at all times. So, the shoulder on the tension side opens up.

In the joint pictured to the right, the drill collar above rocks to the left in bending; the shoulder on the right hand side opens up, the shoulder on the left-hand side has additional compression. Notice we have severe tension load applied to the pin threads by bending. As the drill collar rotates a half turn, the side that a second ago was in compression is now in tension. The side that was in tension is now in compression.

This rocking back and forth produces symptoms which we can recognize as results of operating a loose joint. Characteristically, there is dry pin and the area around the shoulder is a dull gray color. These facts mean that fluid has been lapping in and out between the shoulders. Every time the shoulder opens up, fluid comes in; as the shoulder goes back into the compressive-loading side, the fluid is squirted out. This lapping of the drilling fluid actually removes some of the metal at the shoulders and produces the characteristic dull gray color.

Mechanics of trouble. Notice also in Fig. 12 that there is a bright shiny spot on the surface of the shoulder. This is a galled surface. There will always

be one immediately opposite it, across the pin 180° away. Let's see how the pin got in this condition. When this joint was first made up, it was well lubricated; there was lubricant across the shoulder and along the pin threads. As we screwed this joint together, we got a certain amount of makeup depending on how much torque or twist we applied. Result was a compressive loading uniformly distributed around the shoulder.

This makeup was not sufficient. In operation, the joint began to rock back and forth, opening up the shoulders and permitting drilling fluid to work in between them. Also drilling fluid began to work its way up through the threads from the bore and out across the shoulders. As the joint rocked back and forth, some of the metal on the shoulders was lapped away. Gradually, there were left two high spots on which the drill-collar joint was rocking; material on all other surfaces at the shoulder was lapped away.

When time comes to unscrew this joint, all the tensile load in the pin is supported at the shoulder on these two high spots. The shoulder surface, previously lubricated is now dry—the lubricants have all been washed away. As we begin to unscrew this joint, there is very high friction on these two spots. This high fraction causes great surface heat momentarily, welding the two members together. Then, one piece tears metal from the other. This tearing of metal from surfaces we call a gall.

Shoulders are only seal. There are some peculiar things about drill-collar joints which are important for us.

In tubing and casing threads, there is a continuous seal in the threads themselves. That is, contact is continuous on the crest, flank, root, opposite flank, back to the crest, and on all points along the thread profile. The threads themselves produce a seal in tubing and casing threads. This is not true in tool joints. See Fig. 13.

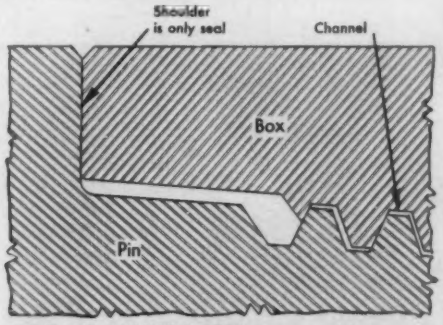
Tool joints are designed with a clearance between the crest and root on every thread. This is necessary because tool joints are frequently screwed together when a well is flowing back through the pipe. As a result, it is necessary to provide some place in the threads where impurities in the mud can be squeezed out as the joints make up.

This clearance at the crest and root of every thread is a channel through which drilling fluid can work its way from the end of the pin up toward the shoulder. The shoulders must be kept tight enough to produce a seal which can withstand the pressure differential from inside to outside of the drill stem. Otherwise, the shoulder will leak. If the leak is severe, there will be a washout across the shoulder.

It is important to regard the shoulders of drill-stem members as if they were valve seats. Suppose you are operating with 1,000-psi. pressure drop across the nozzles of your bit. This valve seat at the shoulder of your tool joints must also withstand a differential of 1,000 psi.

The shoulders must be kept smooth and clean. They must be held together so tightly that even in bending they never separate and never permit fluid to pass at high pressure differential. If the mud passes

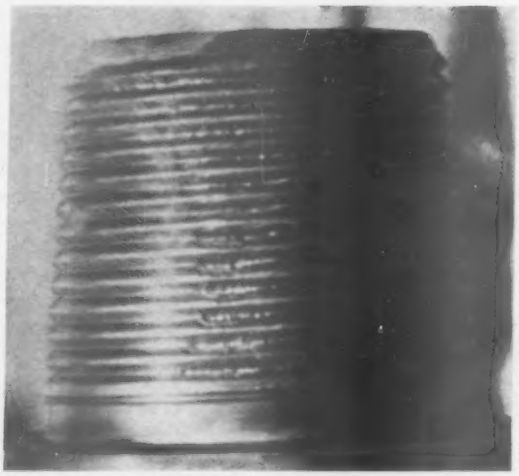
GALL ON SHOULDER is consequence of too little makeup of drill-collar connection. A second gall (a bright, shiny spot) will also appear immediately opposite. Galls result when too little makeup permits lubricant to wash away. Fig. 12.



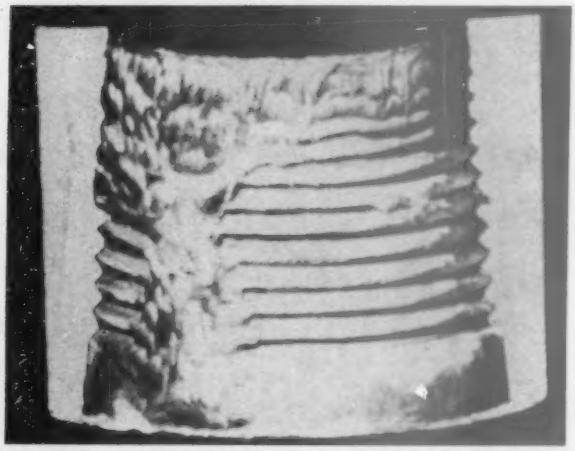
THREADS CANNOT SEAL in a tool-joint connection or drill-collar connection as do threads in casing and tubing. Shoulder is only area where joint can be sealed. Collar threads have clearance between crest and root which acts as channel for lubricant, fluid. Fig. 13.

TEARING IN BREAKOUT DIRECTION as indicated here, is characteristic of perhaps 90% of galls in drill-collar joints. This fact is proof that hard-to-break joints are usually the result of too little makeup when the collar was run into the hole. Fig. 14.

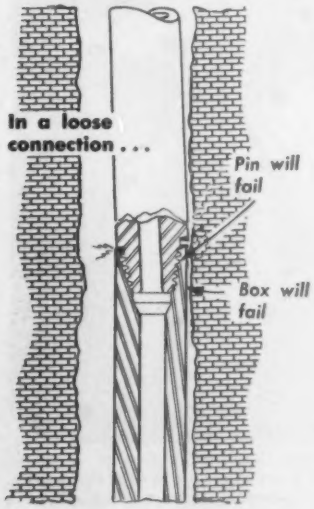
TYPICAL DRY PIN shows that the joint was operated loose. Gall on shoulder is in breakout direction as are majority of galls. Joints do not makeup further in the hole; for this reason, makeup must be plenty tight when collars are run. Fig. 15.



WASHING AND EROSION mark this pin which was operated loose while drilling. Mud squirting through the joint as shoulders opened up actually carried away the steel material of the joint. Also, lubricant washed away, making joint hard to break out. Fig. 16.



WASHOUT OF DRILL-COLLAR BOX is condition that can develop rapidly if the joint isn't made up tightly enough and if there is a lot of sand in the mud. Washing and eroding aren't only consequences of too little makeup; fatigue failures are frequent result. Fig. 17.



FIRST or second thread near the base of the pin are normal locations for failures which result from operating a joint too loose. Such pin failures are much more common in good joints than are box failures. Fig. 18.

across the shoulder, three things happen: Lubricant between the shoulders washes out. Surface of the shoulder begins to lap. And if enough mud moves through, lubricant washes away from the threads as well as from the shoulders. In many instances, part of the metal in the threads actually erodes away.

Notice also in Fig. 14 that we have again the two high spots—top and bottom. These two high spots are again galled or torn. Note that the tear is in the break out direction.

Hard-to-break joints. Probably 90% of the galls on drill-collar joints are in the breakout direction. This is further proof of the fact that most hard-to-break tool-joint problems are the result of inadequate makeup.

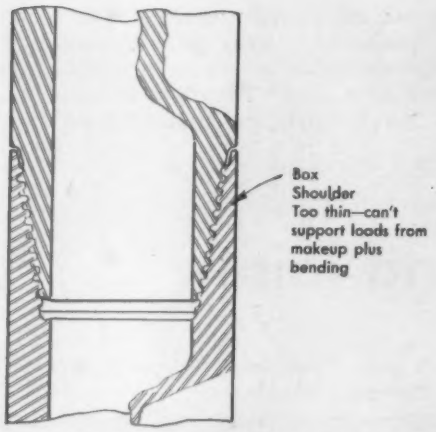
This may be hard to believe when you are having extreme difficulty in breaking out the joints, but the basic reason for the trouble is that you did not make up the joints tight enough before running them in the hole. You have permitted the fluid washing through the threads to remove the lubricant. The grease is replaced by mud, a very poor lubricant.

Joints when made up and lubricated properly, have a coefficient of friction of about 0.06 to 0.08. If the lubricant is washed away by drilling fluid, coefficient of friction is 0.2 or 0.3, appropriate for a dirty metal-to-metal contact with no lubricant. That is why it is so difficult to break out joints not properly made up.

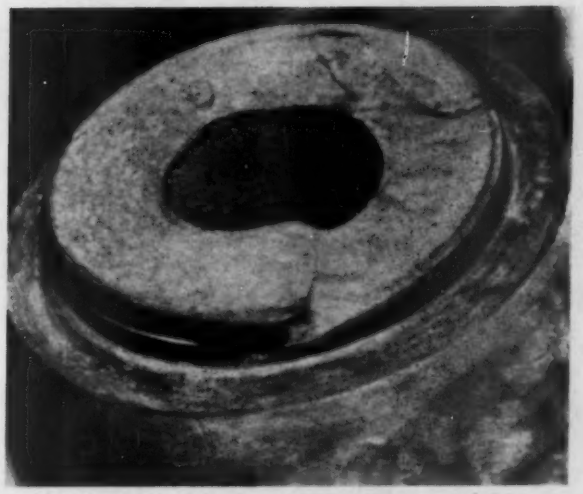
With one exception, all hard-to-break joints are of this type. The one exception is the result of reaming with a very large bit, or some other circumstance which puts extremely high torque in the drill string. In such cases there is actually additional makeup of the joints in the hole.

Under all normal drilling the joints do not make up in the hole. In fact, joints properly lubricated and made up break out at approximately the same torque used to make them up.

Fig. 15 shows a typical dry pin which was operated loose, and again we see the gall in the breakout direc-



BOX FAILURES ARE UNCOMMON consequence of too little makeup but do result when there is poor balance in joint size for collar size. Such failures occur not at the bottom of the box but at about the third or fourth thread from shoulder. Fig. 19.



LAPPED OUT PIN SHOULDER marks this pin failure typical when joint isn't made up tightly enough. The lapping which occurred before failure was bad enough to dish out, or cup the pin shoulder. Fig. 20.

tion. Fig. 16 is a side view of a pin operated loose and in which there is severe washing and actual erosion of the steel in the thread section.

In Fig. 17 you see a cross-section of an extreme washout in a box. This condition can develop rapidly if there is much sand in the mud. There is little of this type of erosion even in a severe washout where low-solids mud is used.

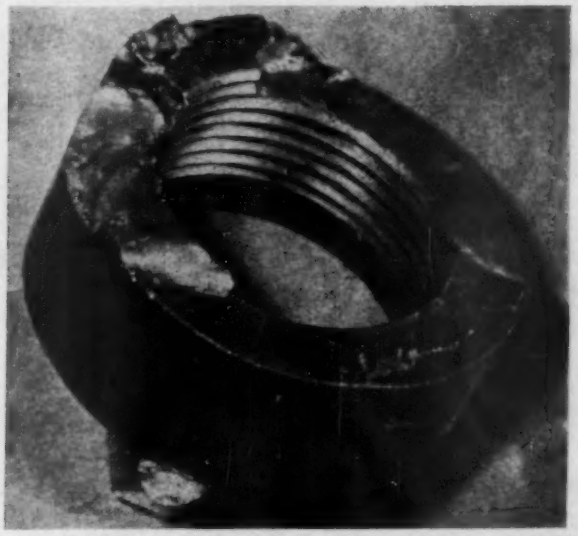
Where loose joint fails. In a joint operated loose, like in Fig. 18, failures normally occur in the first or second thread near the base of the pin.

Occasionally, the box fails—not at the bottom but rather 1½ to 2 in. from the shoulder, at about the third or fourth thread; such failures (see in Fig. 19) usually occur when the joint is relatively large for the size of the drill collar. In this case, the box shoulder is very thin or narrow and so weak it cannot support the bending stresses imposed upon it by the pin. The shoulder flares open with the pin as the pin bends—flaring backwards, creating high bending stresses on the inside of the box near its mouth. This action starts fatigue failures of the box threads close to the shoulder. Such failures are frequent in areas where drillers use high rotary speed, relatively large pins, and thin box shoulders.

Box failures of this type are rare if the joint has a good balance of size. We will discuss this balance later.

Fig. 20 shows the typical pin failure resulting from loose operation. Notice that before failure occurred, there was actually enough lapping to dish out, or cup, the pin shoulder. Fig. 21 is a box failure, which resulted from loose operation. This box was relatively thin in section and was not strong enough to support the bending load imposed by the pin.

Too much torque. We have been talking about failures in pin members caused by too little makeup torque. It is unfortunate that we can also produce failures by using too much makeup torque. These failures (Fig. 22) all occur in the same place—in the first or second thread near the base of the pin.



THIN SECTION IN BOX was not strong enough to support the bending load imposed by the pin. Too little makeup then produced this box failure. Such failures are most common where rotary speeds are high and joints have large pins, thin box shoulders, Fig. 21.

FAILURES are all at same place when joint is made up too tightly; this place is in first or second thread near base of pin. Pin and box threads are elements of simple screwjack with enough mechanical advantage to cause failure if torque is too high. Fig. 22.

Our pin-and-box members are in reality a simple screwjack. This screwjack assembly is used to pull the two shoulders together very tightly. The drilling rig has power enough that if we continue pulling hard enough after the shoulders are tight, something must break. Either the pulling line breaks, or the tongs, or the pin pulls off the male member, or the box on the female member swells open. With this screwjack, there is enough mechanical advantage to produce failure by using too much force. Therefore, we must be certain to use enough torque, but be careful not to use too much.

Tips on selecting joints

We have talked about the basic troubles with drill collars and the reasons for those troubles. Let's look now at ways we can improve collar life by good design. The primary thing we can do is to select a **well-balanced** joint. Engineers have learned that it is important to compare the bending strength of the pin near its base with the bending strength of the box at its bottom at the end of the pin, Fig. 23. Experience teaches that in a good design the box is 2½ times as strong as the pin at these cirtical locations.

Fig. 24 is a chart using this strength ratio. It is an excellent guide in selecting the best joint for a drill collar of any specific outside diameter and bore.

In using such a chart remember to allow for wear on the box if you are in an abrasive area.

Also, remember that it is the bore through the pin that is important to joint strength. We often make allowance for that fact by using a step bore as in Fig. 25. For 3 ft. on the pin end, the bore is small to insure pin strength. Through the remaining 27 ft., the bore is larger to keep down hydraulic loss. In turbulent flow of mud through the drill collars, the changes in section do not add to the pressure losses; you merely add all the small-bore lengths and all the large-bore lengths to calculate the total pressure loss through the drill-collar bore.

Thread design critical. Even after we select the best balanced joint for our drill collar, we have other design factors to consider. Fig. 26 shows three cross-sections through a drill collar which is 6-in. outside diameter and 2¼-in. inside diameter, and on which is a 4-in. H-90 thread. On the left you will notice at the base of the pin a couple of unengaged threads. Also, in the bottom of the box, there are several unengaged threads.

This is standard joint configuration made necessary by the manner in which drill-collar joints are threaded in a machine shop. If the shop uses a single-point lathe tool in threading, threading begins at the end of the pin and moves toward the shoulder. The machine operator begins to back out his threading tool before it runs into the shoulder. For this reason, the last two threads are shallow, not full depth. To offset, the box is counterbored so that there are no threads in the box to engage the incomplete threads at the base of the pin.

Likewise, in threading from the mouth of the box toward the bottom, the operator must again back out his threading tools to avoid running into the shoulder in the bottom of the box. Result again is a few shallow threads.

Furthermore, we occasionally find longer-than-standard pins. These must be provided for by adding one or two extra threads.

These unengaged threads at the base of the pin and the bottom of the box occur at unfortunate places. They are at points where stress concentration is maximum as a result of bending of the collars. These unengaged threads produce notches at the points where fatigue failures are most likely to start. It would be very handy if we could remove these notches by removing the threads. Doing so would increase life of the joint.

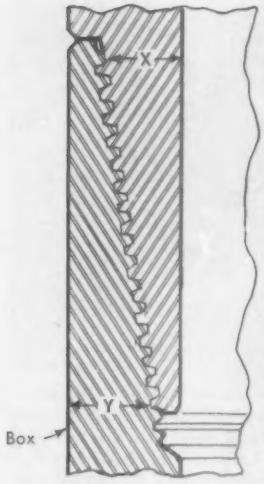
In the center cross-section of Fig. 26, this has been done. Shown there are the stress-relief grooves until recently recommended by the API Standardization Committee for drill collars. Notice the undercut or stress-relief groove removes the threads at the base of the pin. There is a similar undercut at the bottom of the box. Notice also that there are no sharp corners. Radii are used everywhere that size or direction of contour changes; there are no sharp corners to produce notches in these critical areas.

When these stress-relief grooves are cut in machine shops, it is extremely important that no tool marks be left. The grooves must be polished as smoothly as practical in the shops.

New API standard. In the right-hand section of Fig. 26 is the new API standard pin design. The groove at the base of the pin is somewhat deeper than the old API groove. Radii in the corner are larger for more uniform, smoother flow of stress around this contour.

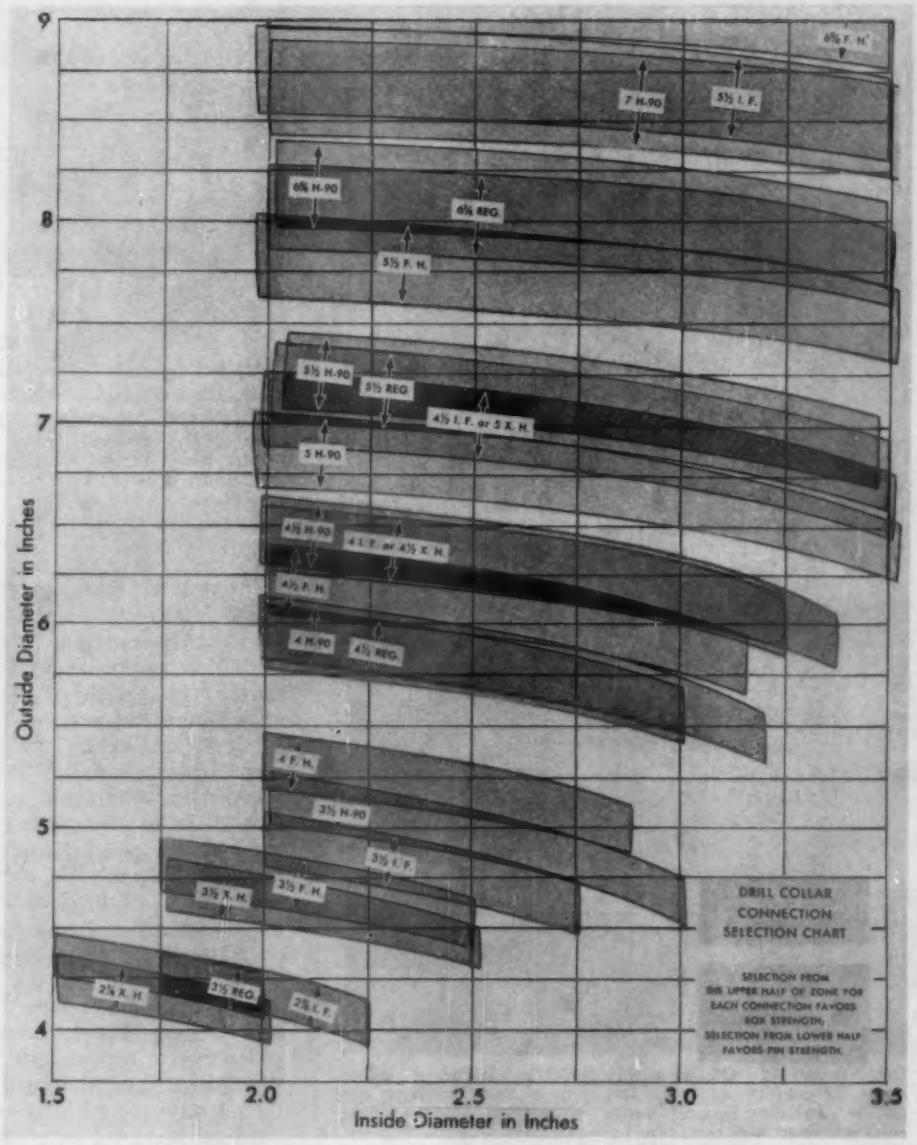
In the bottom of the box is a long cylindrical bore which we call the boreback. This contour attempts to promote the gradual bending which Fig. 8 showed on bending baling wire. Purpose is to spread the bending over a distance of 4 or 5 in. rather than concentrating it in 1 in. as did the old API relief groove, or in a fraction of an inch as does the standard joint. These stress-relief contours are effective in reducing stress concentration in the joints. When properly made with a minimum of tool marks and well polished, they last exceedingly well.

Eliminate notches. It has been mentioned that removing tool marks is exceedingly important in preparation of stress-relief grooves. There are other things that can be done in machine shops and in design to help lengthen joint life. These things aim at eliminating stress concentrations or notches of any kind. It is important to select a drill-collar joint which has a large radius at the bottom of the thread root.

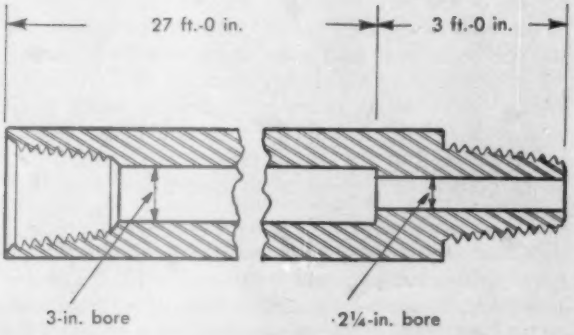


Calculate bending strength of "X" and "Y"

CRITICAL POINTS of strength in selecting drill-collar joints are the pin near its base and the box at its bottom at the end of the pin. In a good design, the box is 2½ times as strong as the pin in bending at these locations. Fig. 23.



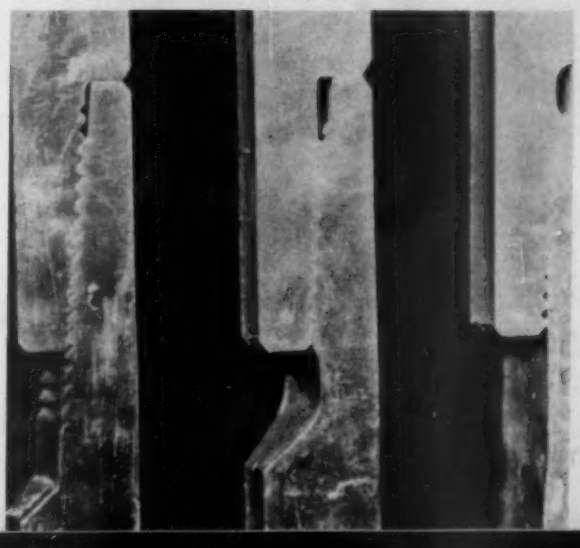
PICK drill-collar joints from a chart such as that at right which is figured on basis of strength ratio between pin and box. In abrasive areas, pick joint which can tolerate the wear that will occur in drilling. (Courtesy Hughes Tool Co.) Fig. 24.

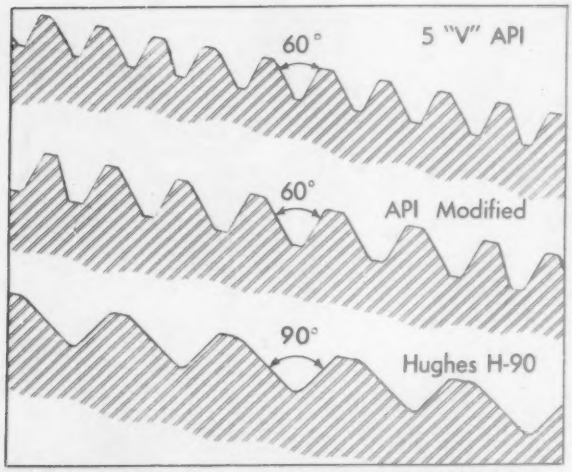


STEP BORE

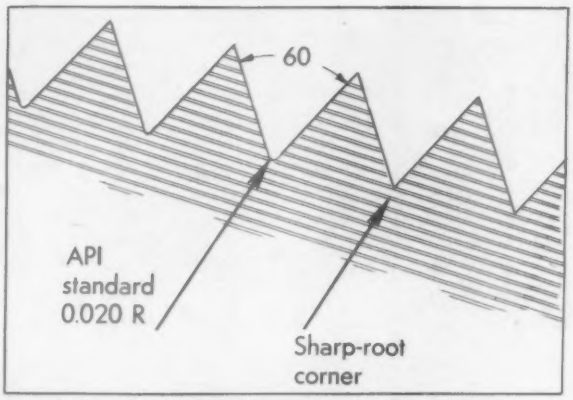
PIN KEEPS STRENGTH when the collar is step-bored as in this drawing. Bore for some 3 ft. on pin end is smaller so that there is more metal in joint pin. In remainder of joint, bore is larger to prevent excess pressure drop in mud stream. Fig. 25.

GOOD THREAD CUTTING is vital to long joint life. At left, below, unengaged threads at base of pin and bottom of box are danger spots resulting from use of single-point threading tool. At center, these "notches" have been removed. At right is new API standard design. Fig. 26.

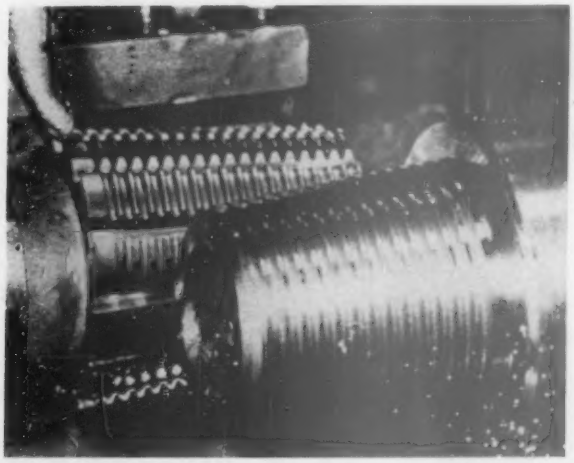




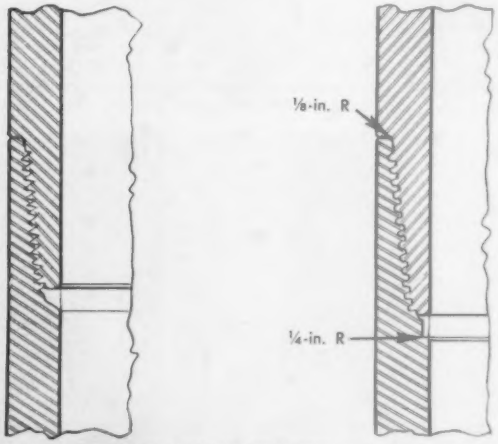
SHARP THREAD ROOTS are poor choice for drill-collar use; the 4½-in. full-hole and 4½-in. regular threads have such sharp threads. The internal-flush and H-90 threads are better since they are flatter and have large radii at corners. Fig. 27.



SINGLE-POINT THREADING TOOLS are often ground carelessly. If so, extremely sharp thread root such as this may result. Sharp thread roots lead to early notch-fatigue failure. Sharp tool marks may be equally bad in thread root. Fig. 28.



THREAD CUT BY HOB, as in this photo, is assured of having exact thread-form contour. The hob, or thread-milling cutter, is precision ground when manufactured; reasonable care will keep it in condition to make good threads. Fig. 29.



SHARP CORNERS ARE DANGEROUS, acting as stress raisers which lead to failure. As in joint at left, bottom of box where bore of box reduces to bore of drill collar is frequent location of sharp corners. Joint at right uses smooth radii instead. Fig. 30.

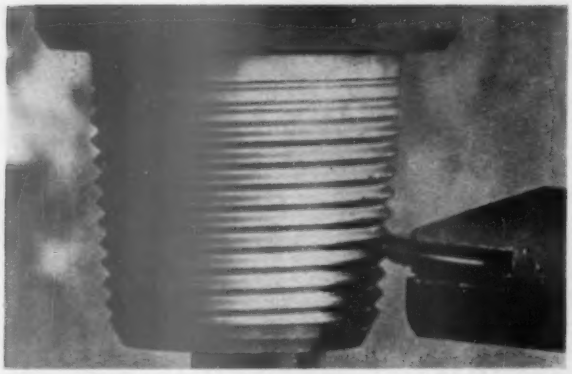
Notice the thread roots in Fig. 27. Thread root of the 4½-in. full hole or 4½-in. regular thread form is extremely sharp; as a result, this joint is not well suited for drill-collar service. Thread root of the IF. thread form and the H-90 form is relatively flat with large radii at the corners. These thread forms are much better for drill-collar-joint service than are the sharper thread forms of the API regular and API full hole.

Machinists who use a single-point lathe threading tool are frequently careless in grinding their threading tools. They may produce an extremely sharp thread root as in Fig. 28. Or, they may cut sharp tool marks in the bottom of the thread root. Such sharp tool marks are essentially a crack produced in the lathe; these cracks grow rapidly in service and cut joint life short.

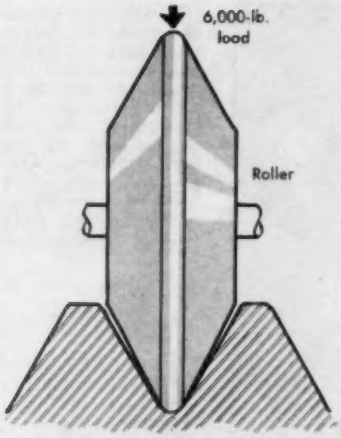
It is for this reason that we prefer hob-cut joints. In these joints, we are assured of getting the exact thread-form contour. The thread-milling cutter, or hob, which produces the thread form has been properly ground when manufactured; it will always produce the proper thread form if kept in good condition. Fig. 29 shows a thread being cut with a hob.

Another feature which frequently acts to concentrate stresses in drill-collar joints is a sharp corner in the bottom of the box where the bore of the box reduces to the bore of the drill collar. Also, at the base of the pin you sometimes find quite sharp corners as in Fig. 30. Any time there is a change in section in a drill-collar joint, or in a shaft, or in any other member which bends as it rotates, it is exceedingly important that a smooth radius be used at the corner rather than a sharp one. Sharp corners are severe stress raisers and frequently cause failures.

Good preventative. Another thing which can improve drill-collar-joint life is to cold work the thread roots. Fig. 31 shows the cold rolling of a thread root on an H-90 joint. This process employs a roller of the same contour as the thread root. The roller is pressed into the thread root with great force by means of a hydraulic ram, Fig. 32, and is then moved down the thread spiral. In this way the roller continuously compresses the thread root as it rolls, leaving the root fibers in compression. Even after rolling is completed, the



COLD WORKING THREAD ROOTS is good way to lengthen drill-collar-joint life. Here, thread roots of H-90 joint are being worked on the pipe racks of a drilling rig in the field. Equipment for this work is light, simple. Fig. 31.

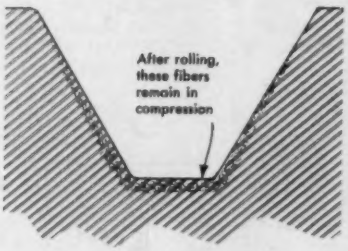


HYDRAULIC RAM forces roller into the thread root and the roller is then moved down the thread spiral. Roller is of the same contour as the thread root and pressure between the two causes a cold working of the metal in the thread root. Fig. 32.

fibers in the bottom of the root remain in compression as Fig. 33 shows. In this state the fibers have improved resistance to fatigue failure in tension.

The easiest way to demonstrate the effectiveness of cold working is with a cigarette as in Fig. 34. Let us hold the cigarette tightly and firmly with its outer fibers neither in compression nor in tension. When we try to bend it, we can't bend very far without a failure of the outer fibers in tension. Now, suppose we compress the cigarette, mashing it together longitudinally so that we compress the outer fibers; we can bend it almost all the way around without failures. The cigarette does not break after the fibers have been placed in compression because you have to overcome the prestress compression loading before you reach a tensile loading. Then, you have to exceed the material's tensile strength by continued bending before it actually begins to fail.

These very same things apply to prestressing thread roots of drill-collar joints by cold working. If we prestress these surfaces in compression, they can stand much more bending before stress reaches the level of tension that produces cracks in these thread roots.



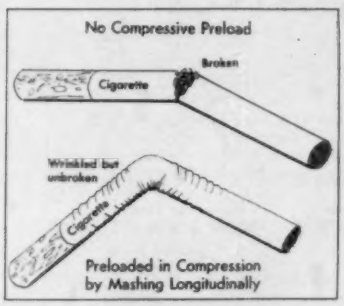
RESISTANCE to fatigue failure is property of cold-worked metal fibers. Even after thread rolling is completed, these fibers remain in compression; as a result they can withstand tensile stresses longer without fatiguing. Fig. 33.

Danger first time out. Another thing machine shops can do to increase drill-collar life is to protect the threads from galling during initial makeup. It was pointed out earlier that 90% of the galls are in the breakout direction. We do occasionally see galls in the makeup direction; almost without exception these galls are on threads which have just come from the machine shop and are bright and shiny. On their first makeup they may gall as they are being screwed together.

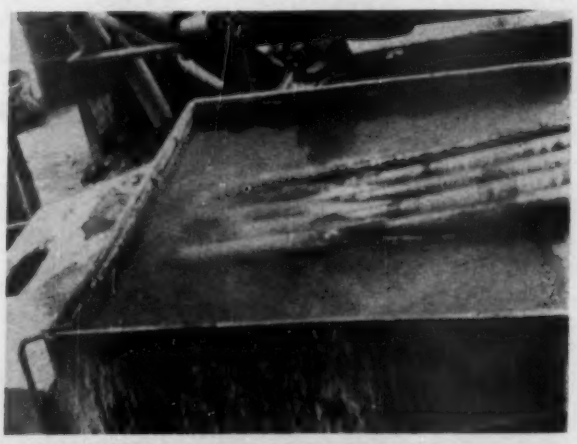
It is difficult to keep a lubricant film on the newly machined surfaces. They are so smooth that lubricants are easily squeezed away, leaving metal-to-metal surface contact. Resultant friction generates sufficient heat locally at the surface to cause the two members to weld together.

One way to minimize galling of newly machined threads is to coat the threads with a gall-resistant material. In this process the ends of the freshly machined drill collars are dipped in a chemical bath, as in Fig. 35, which produces an iron-manganese-phosphate coating on the threads. This coating in itself is gall resistant.

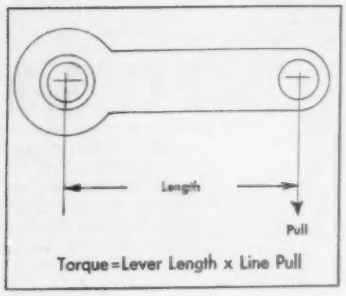
Besides, the solution is slightly acid and etches the surface, producing thousands of tiny pits. These pits



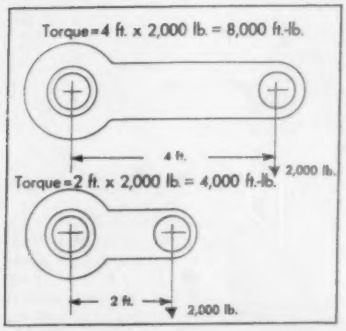
"COLD-WORKED" cigarette shows effectiveness of the method in drill-collar connections. First cigarette, held tightly and firmly, breaks when bent. The second, mashed longitudinally beforehand, can be bent almost double without breaking. Fig. 34.



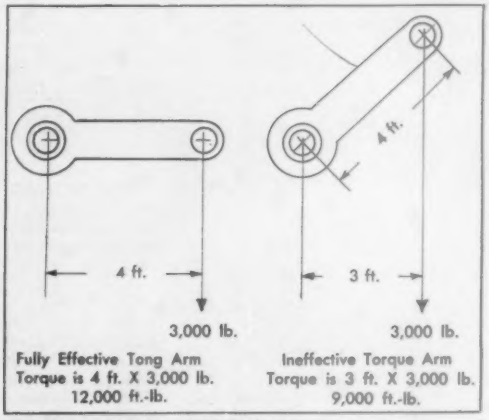
TO PREVENT NEW-THREAD GALLING, joints are dipped in a chemical bath which deposits an iron-manganese-phosphate coating on the threads. Without this coating, the new threads are smooth and lubricant is squeezed off easily. Result: galling. Fig. 35.



TORQUE is measure of twist. To figure torque, in foot-pounds multiply length of the tong arm in feet by the pounds of line pull at the end of the tong. Small rigs with short tongs often have joint trouble as a result of too little makeup torque. Fig. 37.



FOUR FEET times 2,000 lb. on the left tong results in a makeup torque of 8,000 ft. - lb. Right tong arm is only 2-ft. long; as a result, torque is only 4,000 ft. - lb. Longer tong takes less pull for same torque. Fig. 38.



ONLY AT RIGHT ANGLES between tong arm and line pull do you get the full torque possible. Thus, when a line-pull measuring device is used, it should be rigged so that it measures pull when the line is right angles to the tong handle. Fig. 39.

STEADY PULL, SII JERK, NO. By jerking the line, the driller may get the line-pull device to show its proper amount; still, the collars are not made up tightly enough. A steady pull overcomes collar inertia and is only way to get proper makeup. Fig. 40.

TYPICAL PLATED THREADS are dark gray or black and have rather rough-looking surface. This surface actually contains thousands of tiny pits which hold lubricant, thus preventing the metal-to-metal contact that causes galling. Fig. 36.

are excellent hiding places for lubricants. Once you have lubricated such a surface the lubricant film clings to it. Since you always have a lubricant film separating the two surfaces, you prevent the metal-to-metal contact which causes galling.

Fig. 36 is typical of the plated threads. Notice the dark gray or black, rather rough-looking surface.

Rig practice

We have talked about things we can do in design and machine shop practice to minimize drill-collar troubles. What are some of the things you can do at the drilling rig? Most important thing is to control drill-collar makeup torque so that the joints are tight enough that the shoulders do not separate in bending, but not so tight that the pin or box fails because of excess makeup.

We constantly refer in this discussion to the term "torque." Torque is a measure of the amount of twist you apply to two members as you screw them together. To find the torque, take the length of your tong arm in feet. Multiply it by the pounds of line pull you apply at the end of the tong arm. The product of feet times pounds gives us units of foot-pounds which we use to describe torque. Fig. 37 illustrates.

Let us say you have a tong with a 4-ft. arm as in Fig. 38. You apply 2,000-lb. load at the end of that tong arm. You produce 4 ft. times 2,000 lb. or a total of 8,000 ft.-lb. of torque. If your tong is only 2 ft. in length, you produce 2-ft. times 2,000-lb., or only 4,000 ft.-lb. of torque.

There is an essential point to remember when working on a small rig where you have short tongs. Very strong pull on your makeup tong line is necessary to produce adequate makeup torque. Frequently, small rigs have drill-collar-joint troubles resulting from improper makeup. In almost every case, the source of trouble is related to the short tong length used on these rigs.

A line-pull measuring device should be used in making up drill collars. It is important that line pull be measured when the line is at right angles to the tong handle. As Fig. 39 shows, you cannot get maximum torque if the pull is at more or less than 90° to

Minimum Torque Requirements for Drill-Collar Connections Ft-LB

Type	OD -in.	Bore 1¾-in.	2-in.	2¼-in.	2½-in.	2¾-in.	3-in.	3¼-in.
3½-in. H.90	4¾	6,900	6,900	6,900	6,900	6,900		
	5	10,800	10,800	10,800	10,800	9,100		
	5¼	14,900	14,600	13,000	11,100	9,100		
	5½	16,000	14,600	13,000	11,100	9,100		
5-in. H-90	6¼			18,700	18,700	18,700	18,700	
	6½			23,600	23,600	22,400	20,700	
	6¾			26,000	24,500	22,400	20,700	
	7			26,000	24,500	22,400	20,700	
	7¼			26,000	24,500	22,400	20,700	
6⅝-in. H-90	7½				30,100	30,100	30,100	30,100
	7¾				35,900	35,900	34,700	32,000
	8				39,000	35,000	32,700	32,000
	8¼				39,000	35,000	32,700	32,000

MINIMUM MAKEUP TORQUES, listed here, are those necessary to insure that the joint is tight enough to forestall fatigue failures. Since these figures are minimums, the makeup should range from the values shown up to about 10% higher. Fig. 41.

the tong handle because you do not get full effect of the tong length.

Steady pull does job. It is also important to apply a long steady pull rather than to jerk the line. See Fig. 40. You may get your line-pull-measuring device up to the mark by jerking the line without properly making up the drill collars. Remember that a stand of drill collars weighs as much as a big truck and is just as hard to start moving. You can break a tow line by trying to jerk a big truck into motion and still not move the truck. Trucks and drill collars must be started moving by a long steady pull. It is the only way to properly make up a drill-collar joint to a measured line pull.

Use recommended torques. Fig. 41 is a segment taken from a table of recommended torques for drill-collar joints. There are **minimum** requirements and we would recommend some 10% higher than this number as a suitable operating range. Let's take a look at the 5-in. H-90 size. For a drill collar 6½-in. o.d. with 2¼-in. bore, 23,600 ft.-lb. torque is recommended. Some 2,000 ft. pounds more would be a good working range.

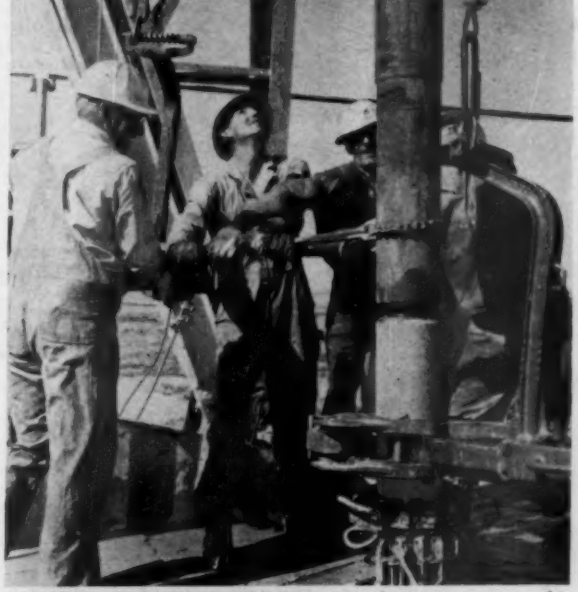
Notice that regardless of the bore for the 6¼-in.-diameter drill collar we would use the same torque. This means that for this size joint, the 6¼-in-o.d. is so small that the box will always be weaker than the pin. Thus, strength of the box controls makeup torque. Let's drop down and look at the 6¾-in. size. You will notice that for 2¼-in. bore, we use 26,000 ft.-lb.; for the 2¾-in. bore 22,400 ft.-lb; and for the 3-in. bore 20,700 ft.-lb. As the bore becomes larger, the pin becomes weaker. And, torque must be reduced to accommodate the weaker pin. In this size the pin is the controlling member.

Remember in using this chart that the calculations are based on standard dimensions and there is no allowance made for modifications of the joints.

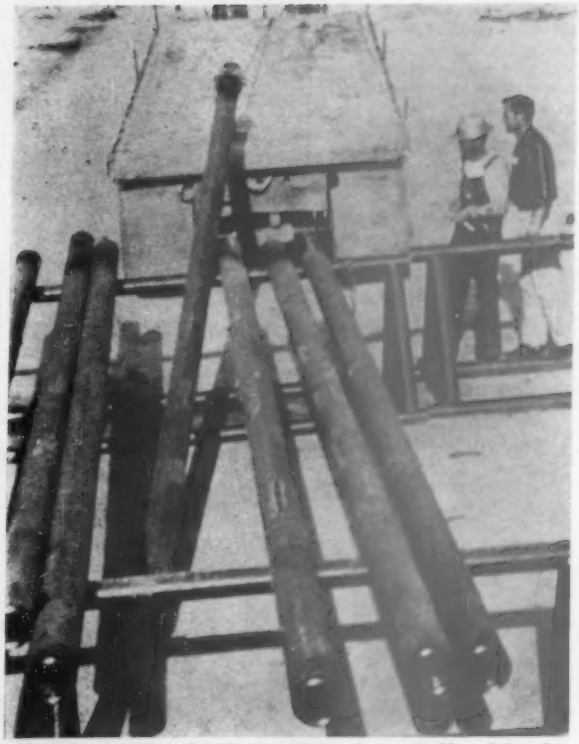
On derrick floor. Second in importance to proper makeup control is proper lubrication, Fig. 42. It is extremely important that the shoulders of the box be lubricated as well as the threads of the joint. Perhaps this is a good place to point out those lift subs lying on the floor beyond the rotary table. Every pin on a lift sub will at sometime mate with every box in the drill-collar string. If these pins are not properly cared

SHOULDER, thread lubrication is vital to proper makeup control. Remember that lubrication is necessary not only on threads but also on the shoulders themselves. Charts for makeup torque are based on joints which have been well lubricated. Fig. 42.

LIFT-SUB THREADS MATE eventually with every box in the drill-collar string. For this reason, the sub threads should be given the same care in handling. Otherwise, they can easily damage collar-joint threads and cause failures while drilling. Fig. 43.

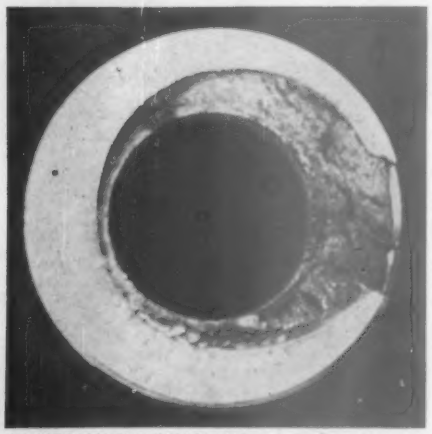


WALKING IN COLLAR JOINTS with chain tongs, as this crew is doing, is good practice but not absolutely necessary. Walking in the joint helps prevent failures but a spinning chain may be used if the crew takes care not to get it caught between shoulders. Fig. 44.



NONSERVICE-CONNECTED INJURY is being suffered by this 8-in. drill collar as it is being pulled off the rack onto a float. The box end is dropping to the ground and there is no protector to prevent shoulder damage when it strikes. Fig. 45.

CHEAP insurance against handling abuses are collar-thread protectors. Much collar damage is the result of careless handling. Thread protectors not only prevent much of the damage, but also make the collars themselves easier to handle. Fig. 46.



CRYSTALLINE APPEARANCE of this pin fatigue failure is what some inaccurately call "crystallizing" of the metal. Actually, brittle-type fracture, resulting from fatigue, is reason for this appearance; no metal flaw is involved. Fig. 47.

for and are permitted to be damaged in handling, they will eventually damage all of the boxes in the drill-collar string. Care of pin threads, Fig. 43, on your handling subs is equally as important as care of any other drill-collar joint.

It is a good practice for the crew to "walk" in the drill-collar joint using chain tongs as in Fig. 44. Doing so minimizes the chance of damaging threads during makeup or breakout.

"Walking" in is not actually essential; if a chain is properly handled and is handed up from lower to upper joint, it is a practical means to spin in drill collars. Be very careful not to get the chain caught between the shoulders. If you do, the box or pin shoulder may be damaged in a way that destroys the sealing effect of the shoulder. Result is a washout.

It also is practical to rotate the collars out. If you do, you must move the rotary table very slowly so the joint does not jump up and down when the threads become disengaged. Probably no hook spring has strength enough to lift out of the box a full stand of drill collars. Still, with proper care, the driller can lift out of the box the drill-collar stand as soon as it breaks out.

Bad handling is murder. A lot of drill-collar damage is the result of poor handling. In Fig. 45 you see an 8-in. collar being pulled off the rack and onto a float. The box end is dropping to the ground with no protector to prevent damage to the shoulder as it strikes the ground. Moreover, as the drill collar is pulled across the tailboard of the float, there is a good chance it will be bent.

Cast-steel thread protectors, such as in Fig. 46, prevent damage to drill collars in handling. They also make it much easier to handle the collars themselves; a hook can be put in the bale of the pin protector to pick up the collars or pull them around.

Thread protectors are expensive, some $35 to $50 per pair. For this reason we cannot recommend they be used for every drill collar in the string. Still, we sincerely believe there should be two or three pairs on every rig to be used in picking up, laying down, and handling the collars.

Collar inspection

We have talked about basic drill-collar problems and how we can overcome them in design, in machine-shop practice, and in care and operation on the rig. There is one more practice that can minimize failures in the hole. That practice is magnetic inspection. This service finds the fatigue cracks in the drill collars as they occur. Then, the cracks can be marked and repaired in machine shops before actual failure in the hole.

Fig. 47 is the end view of a pin showing typical fatigue failure. Notice that the crack began on the outside of the pin and progressed gradually, lapping as it went, and producing a smooth polished surface. Eventually, too little strength was left to support the load when the string was picked up off bottom; the joint promptly failed. The brittle failure produced the rough crystalline appearance.

In the oil field, it is common to say that the metal has "crystallized." Metallurgists tell us that this is an inaccurate expression, that the metal was crystalline when cast and will remain crystal until melted again. Basically, the metal's crystalline structure has not been changed by its use in drill-collar service. Reason for the rough, jagged appearance of the surface is the type of failure. The rough crystalline appearance is characteristic of a brittle-type fracture.

The hammer marks you may see on the surface in Fig. 47 were produced in attempting to unscrew the dutchman from the box.

How soon does failure occur in drill-collar pins which have been properly operated and are in well-balanced strings? In West Texas, the first shallow fatigue cracks appear, as Fig. 48 shows, after some 3,500 hours of rotation. At about 4,000 hours these cracks begin to grow and additional cracks appear. Somewhere around 4,500 hours the cracks become quite deep and join up with other cracks. Between 4,000 and 5,000 hours, failure in the hole can be expected because of the growth of these fatigue cracks.

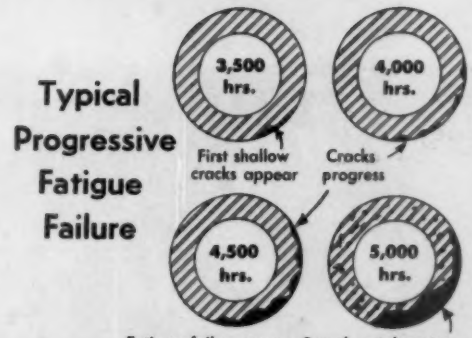
These hours of life are typical for one particular area and one particular type of operation. You can't expect such life without good practice; fatigue failures has come in less than 1,000 hours of rotation when joints are improperly machined or improperly operated. We think that 4,000 hours is excellent drill-collar life.

Uses bar-magnet principle. Magnetic inspection uses the principle of attraction of magnetic particles to a bar magnet. Most of you know what happens if you sprinkle magnetic particles or iron filings onto a bar magnet. The particles are attracted to the north pole and to the south pole at the ends of the magnet. Perhaps you did not know that if you break a bar magnet in half, you would have two bar magnets, each with a north pole and a south pole. Or, if you notch a bar magnet as in Fig. 49, one-half the notch is a south pole and the other half is a north pole; iron filings sprinkled along the bar would be attracted to the notch because of these north and south poles.

In magnetic inspection of drill-collar joints, the drill-collar joint is magnetized to make it a bar magnet. If there is a crack or a notch in the collar, magnetic particles will be attracted to this crack, because one side of the crack would be the north pole and the other side the south pole as in a bar magnet. The magnetic particles, having been attracted, build up and we can see them as in Fig. 50. When we see the magnetic particles, we know there is a crack, although it may not be visible to our naked eye.

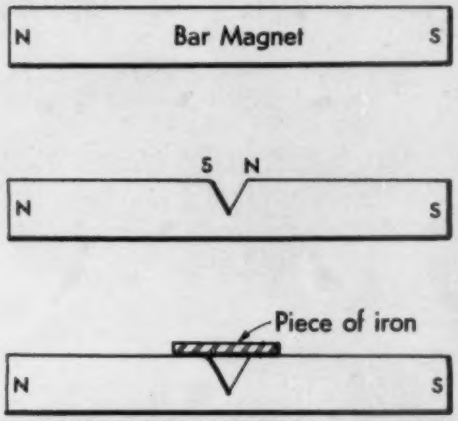
In the field. The equipment for magnetic inspection of drill collars is carried in a pickup truck or a trailer similar to the one shown in Fig. 51. This particular trailer has a 3-kw. light plant, a magnetizing unit, pressure spray cans, and hand tools necessary to clean and inspect collars. When an inspector arrives on location, he spreads out the collars as far apart as practical; Then, he has enough space, see Fig. 52, around the collars to work.

First step is to identify the drill collars and take their measurements. First measurement is, as Fig. 53 shows, outside diameter of the box. Next is inside diameter at the pin end, Fig. 54. These two figures are

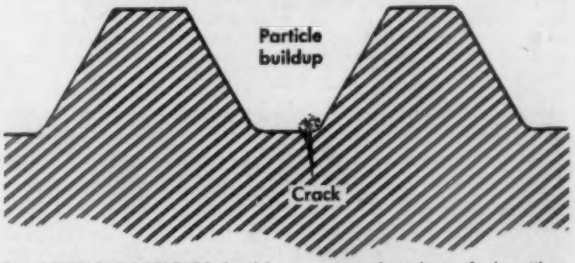


Fatigue failure occurs. Sound metal ruptures leaving fracture face with "crystallized" appearance.

WITH PROPER OPERATION, the first shallow fatigue cracks begin to appear at about 3,500 hours. Failure in the hole can be expected between 4,000 and 5,000 hours. In hard-rock-drilling of West Texas, 4,000-hour life is good. Fig. 48.



PRINCIPLE OF BAR MAGNET is used in drill-collar inspection. If bar magnet is cut in two, or if it is notched, one half of notch is south pole; other half is north pole. Cracks in drill collars behave in same way when magnetized. Fig. 49.



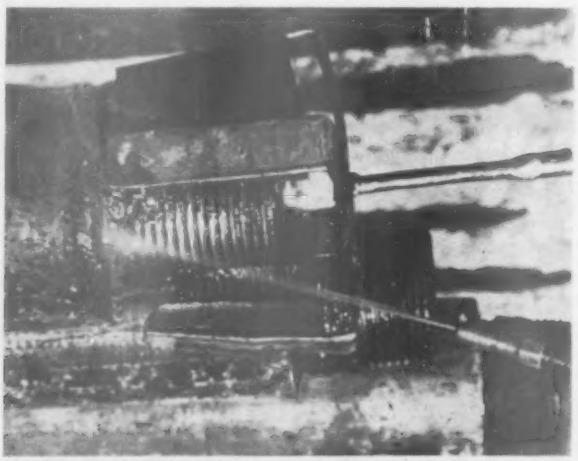
MAGNETIC PARTICLES build up around poles of the "bar magnet" created by magnetizing the drill-collar joint. When the inspector sees these particles (iron filings), he knows there is a crack even though it may not be visible to the naked eye. Fig. 50.

INSPECTION EQUIPMENT is light enough to be hauled to the field in a pickup truck or a trailer similar to this one. Thus, collars don't have to be trucked at great expense. Equipment includes light plant, magnetizing unit, spray cans, and hand tools. Fig. 51.

COLLARS SPREAD OUT on racks give inspector plenty of space in which to work. With collars as far apart as possible, inspector can magnetize them, file shoulders, grind out cracks, check thread profiles, and take measurements. Fig. 52.

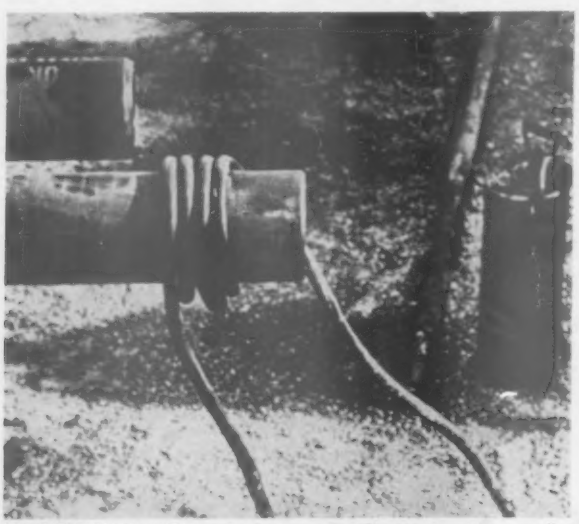
OUTSIDE DIAMETER of box is first measurement made by drill-collar inspector. Abrasion may have reduced diameter, thus reducing box strength so that a new makeup torque must be recommended. Fig. 53.

INSIDE DIAMETER of pin end of collar is next measurement to make. Combination of this diameter and outside diameter of box is what determines best makeup torque. Tally lengths and serial numbers (if any) are also recorded at this time. Fig. 54.



ELECTRICALLY DRIVEN PIN CLEANER is fabricated from ½-in. electric drill and wire brushes. Lubricant and debris must be removed for effective magnetic inspection. Kerosine spray cuts oil and grease and washes pin during brushing. Fig. 55.

ROUND BRISTLE BRUSH cleans box threads prior to inspection. Kerosine is also used as wash during this operation. Pressure-spray can is handy means of applying the kerosine. Fig. 56.



MAGNETIZING UNIT coiled around collar magnetizes it for inspection. Half-wave rectified current is passed through coils. Often the collars have already been magnetized as a result of drilling in earth's magnetic field. Fig. 57.

FINE MAGNETIC PARTICLES, coated with fluorescent dye, are sprayed into a fluid into the joint after it has been magnetized. The magnetic particles are attracted to the area of cracks as they would be to notches in a bar magnet. Fig. 58.

necessary to figure the best makeup torque for these collars. If there are serial numbers on the drill collars these will be marked and recorded along with the tally lengths.

After this information is recorded, the operator cleans the threads. Fig. 55 is a closeup shot of a pin cleaner fabricated from wire scratch brushes; it is driven by a ½-in. electric drill. Kerosine in a pressure spray can is a good wash for the joint as it is cleaned.

A round-bristle brush like that in Fig. 56 is used to clean the box. Again, kerosine makes a good wash during cleaning.

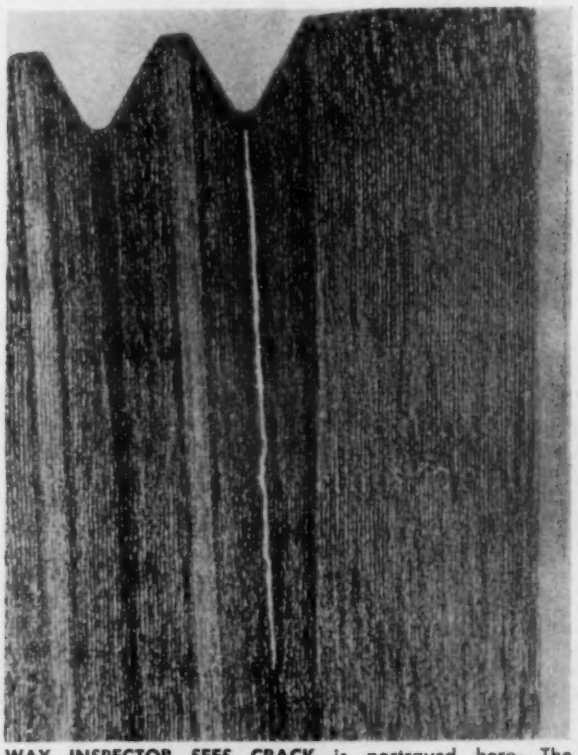
Must be magnetized. After the joint has been completely cleaned and all traces of grease removed, the drill collars are checked to see if they have been magnetized; the inspector uses a special magnetic-field indicator for this purpose. Most drill-stem members which have been in service for long become magnetized as a result of normal operation.

Perhaps you remember what happens if you take any soft iron bar, hold it in the north-south direction, and hammer upon it. The bar becomes a magnet because the particles in it have aligned themselves with the earth's magnetic field. Drill-stem members are run constantly in the earth's magnetic field and they are hammered constantly as they bounce against the wall of the hole. Very frequently they become magnetized as a result.

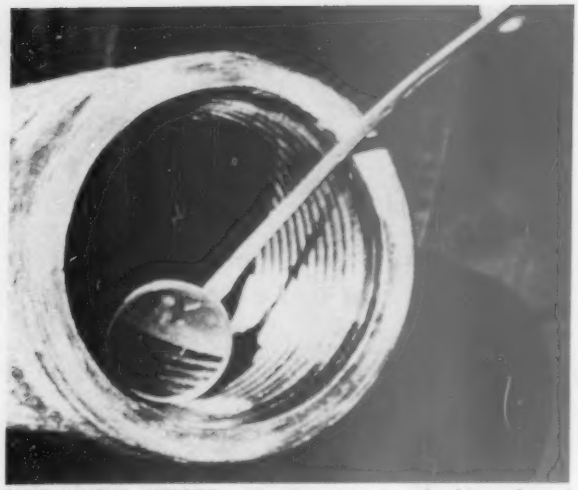
If the joint is not sufficiently magnetized for inspection, it is magnetized by wrapping the coils of a magnetizing unit around the collar bar. Then, passing a half-wave rectified current through the coils makes an electromagnet of the collar bar. Fig. 57 shows the magnetizing coils.

Black light reveals cracks. After the joints have been magnetized, they are sprayed, as in Fig. 58, with a fluid containing finely divided magnetic particles. These particles are coated with a fluorescent dye. As fluid drains away from the joint, the magnetic particles are attracted to any area where there are cracks. If you look at the joint using an ultraviolet light or black light (as the inspector is doing in Fig. 59), in darkness,

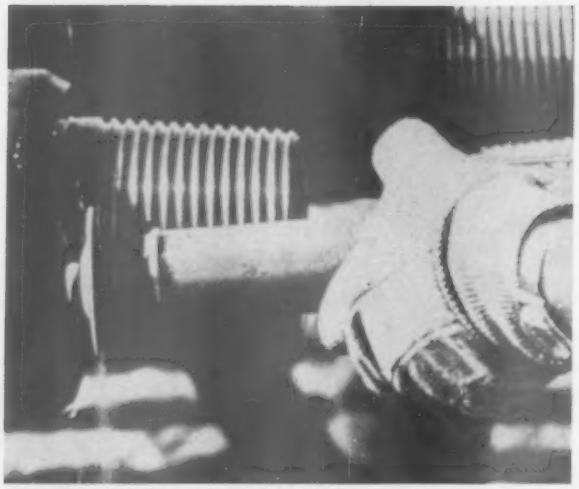
SHINING BLACK LIGHT onto the magnetized joint shows this inspector where the fluorescent magnetic particles have collected. In darkness, these particles glow under the black light. In daylight, the inspector uses a heavy black canvas hood. Fig. 59.



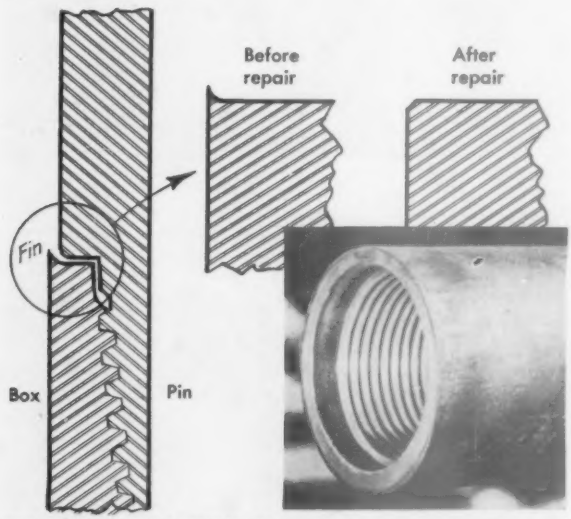
WAY INSPECTOR SEES CRACK is portrayed here. The fluorescent dye would make such a crack in a pin thread stand out brilliantly. Result is that the inspector can easily spot cracks that would not otherwise be visible even in bright sunshine. Fig. 60.



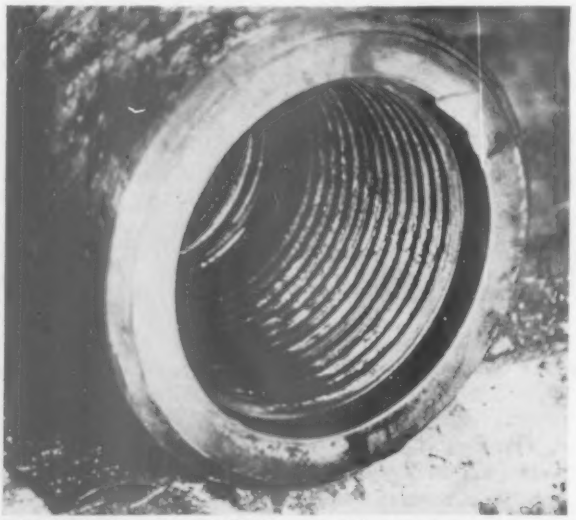
MAGNIFYING MIRROR aids inspector in checking thread roots all the way to the bottom of the box. Light shined into mirror reflects light onto threads, making it easy to spot cracks in box. Box counterbore is also checked for "stretch." Fig. 61.



SHALLOW CRACKS CAN BE GROUND out so that the collar need not be hauled to the shop for cutting new threads. Grinder is relatively soft and has smooth radius so it doesn't leave sharp notch. Cracks deeper than 0.030-in. mean joint must be reworked. Fig. 62.



FINS FORM ON SHOULDERS particularly where collars of different diameters are used together. Such fins may fold over, catch between the shoulders and prevent their making a seal. Hand file can remove these. Fig. 63.



DAMAGE TO BOX SHOULDER, caused by carelessness as the drill collars were being laid down, can be repaired. Outside and inside edge of box shoulder near the dent is peened to raise dent. Then, shoulder-facing tool makes surface flat and smooth. Fig. 64.

any of the magnetic fluorescent particles which remain glow. Thus, we readily find the crack.

A heavy black canvas hood can produce darkness for inspecting in daylight.

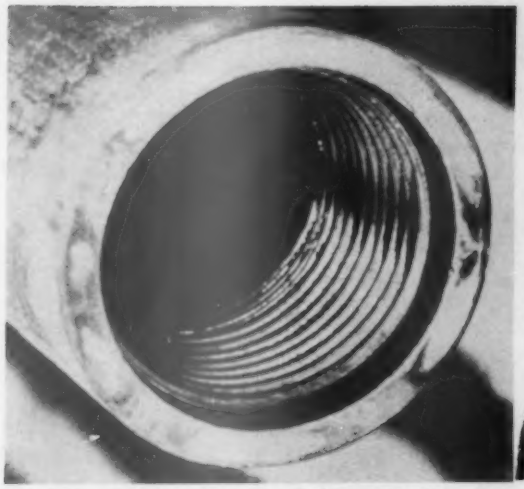
If the inspector finds a crack in a pin thread, its appearance to him as he looks at it with the ultraviolet light is like Fig. 60. The fluorescent dye makes the crack stand out brilliantly; thus you easily see a crack that you might not be able to spot in daylight with the naked eye.

In looking for cracks in the box thread, the inspector uses a magnifying mirror like that in Fig. 61. He shines the light into the mirror reflecting the light into the threads. This lets him see the thread roots all the way to the bottom of the box threads.

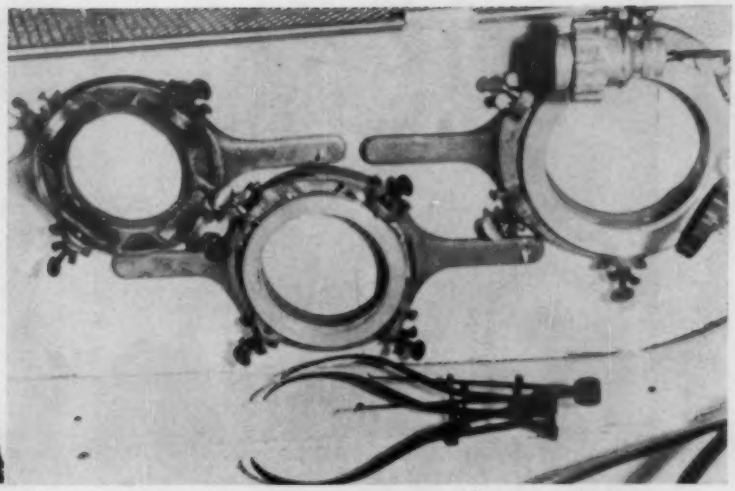
Hand tools may fix. If we find a minor crack in the threads, we attempt to remove it the way Fig. 62 shows, with an electric hand-held grinder. For this, we use a soft rock which has a smooth radius surface that can produce a smooth-bottom, round-bottom thread where the crack has been ground out. If we can remove the crack by grinding no deeper than 1/32 in., 0.030 in. the joint is satisfactory for additional service. If we cannot remove these minor cracks by grinding as deep as 1/32 in., we mark the joint "cracked" to be reworked or rethreaded.

Frequently we can salvage joints by grinding and they perform satisfactorily for a number of wells before again showing fatigue cracks in the area.

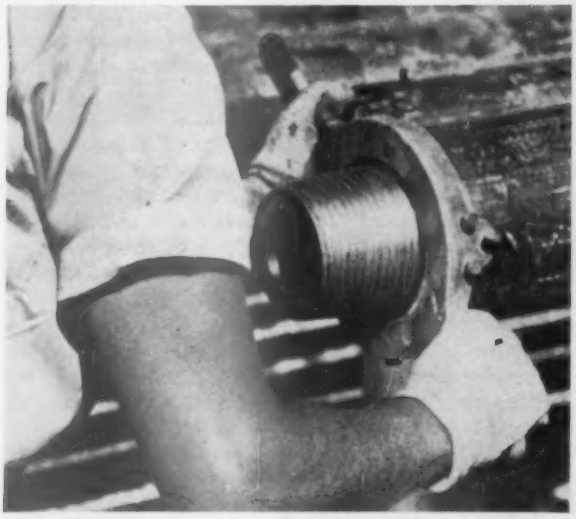
One thing we frequently find when inspecting drill collars is that fins like those in Fig. 63 build up on the shoulders, particularly where two collars of different diameters are in use together. These tiny fins may fold



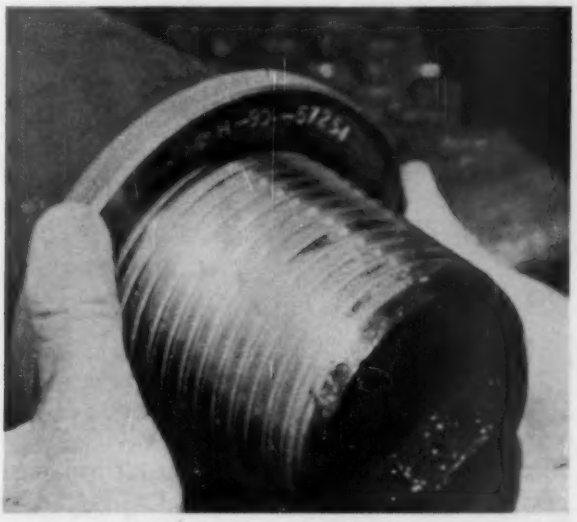
MAKEUP was almost tight enough on this joint. But, since it was not quite tight, a few high spots are beginning to build up on the shoulder. Shoulder-facing tool can repair the damage. Fig. 65.



SHOULDER-FACING TOOLS such as these are simply frames for holding flat files to dress drill-collar-joint shoulders. When shoulder facing is necessary, it is well to learn the cause and warn the rig crew so mistakes are not repeated. Fig. 66.



FILING PIN SHOULDER FLAT, shoulder-facing tool prevents greater damage that might occur later during drilling. After filing the shoulder down flat, a flatness ring gage checks to make sure that the surface will mate and make seal. Fig. 67.



RING GAGE rocks when pressed against the shoulder if there are high spots on the shoulder. This means more filing is necessary. If gage does not rock, sighting behind it shows if there are low spots. Low spots also require more filing. Fig. 68.

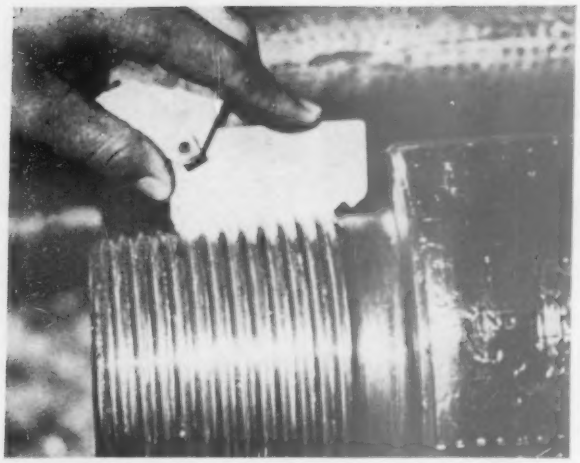
over and get caught between the two shoulders. Thus they may prevent the shoulders from mating and producing a seal no matter how tight you pull the joints up. It is exceedingly important then that these fins be removed as soon as found.

We recommend you keep a flat file on the rig to remove these fins as soon as you notice them. Always maintain an adequate bevel at the shoulder so that the fins do not build up. Be careful when filing that you don't permit the file to work across the flat face of the shoulder. Doing so may damage the shoulder so that it will not seal.

Shoulder-facing tools. Fig. 64 shows a joint damaged by something striking it across the shoulder in handling. In this particular instance, the damage occurred as the drill collars were being laid down. Such damage can be repaired by a shoulder-facing tool. It is necessary to peen the outside edge and inside edge of this box shoulder near the indentation to raise up the dent. Then using a shoulder-facing tool, you can file down the high spot you raised up until the shoulder is flat and smooth.

Fig. 65 is a joint which has been operated **almost but not quite** tight enough. On this joint, there is a characteristic dull-gray color in several places around the shoulder. A few high spots are beginning to build up. This shoulder can be repaired by a shoulder-facing tool, but it is important to caution the rig crew to use higher makeup torque on this joint than before.

Some shoulder-facing tools, Fig. 66, are simply frames for holding flat files to dress the shoulders. Fig. 67 shows such a tool being used on a pin shoulder. After the shoulder has been filed flat, we use a flatness



THREAD-PROFILE GAGE shows if joint has been stretched in service. Gage is placed on first two or three threads near base of the pin. If there is stretch, quite often it is result of too little makeup which allows joint to "work" while rotating. Fig. 69.

CHECKING COUNTERBORE OF THE BOX shows if there is any stretch. Usual cause of stretch at this point is too tight makeup. Drill-collar joint contains element of simple screw-jack capable of causing damage if too much torque is used. Fig. 70.

THREADS GET RUST PREVENTIVE after the inspection job is complete so that the joints do not rust before being put back into service. It is also good practice to use cast-steel thread protectors to forestall handling damage. Fig. 71.

ring gage which comes with the facing tool to check that the shoulder is flat and smooth.

If the ring gage rocks when you press it against the shoulder, as in Fig. 68, there are high spots on the shoulder and you must do more filing. If the ring gage does not rock, then you must sight behind the shoulder to see if there are low spots. If you see any light behind the ring, there are low spots and you have more filing to do.

If the flatness test ring does not rock when you press on it and you cannot see light behind it at any point, then you have a flat smooth shoulder which should produce an adequate seal when the joints are properly made up.

To see if the joints have been stretched, we check with a thread profile gage, like that in Fig. 69, on the first two or three threads near the base of the pin. We check the counterbore of the boxes to see if the joints may have been stretched by excessive makeup, Fig. 70.

Mark and record. After the inspection job is complete, we spray a rust preventive in the threads so the joints do not rust before being put into service again, Fig. 71. We mark each joint to designate its condition as in Fig. 72. If there is damage to the threads (other than cracks) which require machine-shop repair, we paint a yellow band around the end of the joint; we also mark it with a legend "leaking" or "damaged threads" or whatever term describes the damage.

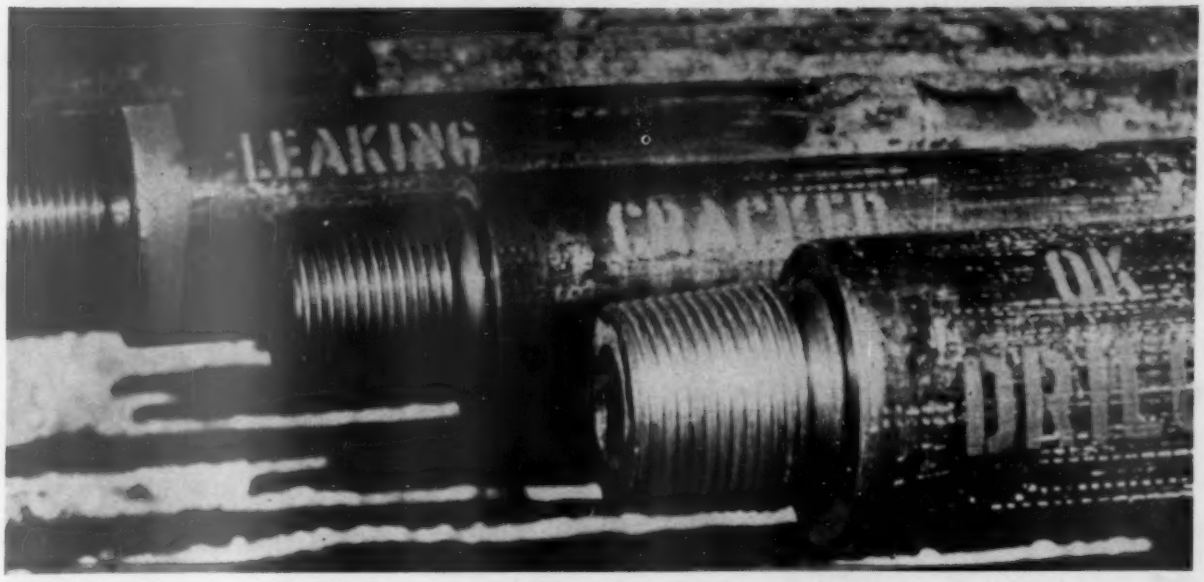
If there is a crack, we mark around the base of the pin, or the end of the drill collar, with a red band, and again mark the word "cracked." If it is a severe crack, we mark the distance from the end of the pin to the crack so that the machine shop will know to cut off the thread at this distance from the end of the drill collar.

If the joint is in good condition, and is suitable for service for the next well, we mark it "OK." This certifies the drill-collar joint should give no trouble if properly handled on the next well.

Fig. 73 is a typical inspection report showing rig number, location on which the inspection was done, a summary of the work done, and a listing by serial number of the condition of each drill collar. The report shows serial number, condition of the box, condition of the pin, bore at the pin end, outside diameter at the box end, and tally length from shoulder to shoulder of the drill collar when we inspected it. At the bottom there is a summary of the inspection results, showing number of joints rejected and number salvaged by minor repairs.

This report becomes a part of our permanent files. Copies are also left at the rig for the contractor's files. The accumulation of these records over the years is extremely helpful to rig operators in giving them a method of checking back to see on which rigs they have best drill-collar service and what types of drill-collar joints and what sizes of drill collars give them best service for certain operating conditions.

Remember one point about periodic inspection of drill collars. Only damaged or cracked joints are re-threaded. Good joints continue to serve. This procedure sometimes means greateer trucking expenses than running the collars until there are so many failures the entire string must be shopped. But, inspection largely eliminates collar-fishing jobs and saves on material.



EACH JOINT is marked after inspection to show its condition. Those found free of defects are marked OK and can continue in service. Others with defects too serious for repair at the rig must be taken to shop before further use. Fig. 72.

TELEPHONES
MIDLAND MU 2-5238 HOBBS, N. M. EX 3-4302
SNYDER HI 3-4381 FARMINGTON, N. M. DA 5-6571
ODESSA FE 2-2841 CORTEZ, COLO. LD 5-9964
SHREVEPORT, LA. 2-8562 BROOKHAVEN, MISS. 2772
LIBERAL, KANSAS MA 4-6801

DRILCO OIL TOOLS, INC.

DRAWER 3135 MIDLAND, TEXAS

FOR	LOCATION	RIG	DATE
GREEN MOUNTAIN DRLG. CO.	UTE MT #23-4	3	3-1-57

	SERIAL NO.	INSPECTION RESULTS PIN	BOX		I. D. PIN END	O. D. BOX END	LENGTH
1	5104	4½ REG BOX - OK	4½ H-90 OK	RG	BHC	6¼	29.23
2	446	OK	CRACKED - G.O. - OK		2¼	6 3/16	29.61
3	1515	OK	OK		2 5/16	6 3/16	28.79
4	442	OK	OK		2 5/16	6 3/16	29.21
5	7712	CRACKED - G.O. - OK	CRACKED - REJECTED		2⅛	6¼	28.89
6	1217	LEAKING - REFACED - OK	OK		2 5/16	6 3/16	29.52
7	1203	OK	LEAKING - REFACED - OK		2 5/16	6 3/16	29.61
8	GM-9	OK	OK		2 5/16	6⅛	29.73
9	1245	CRACKED - REJECTED	OK	BB	2⅛	6⅛	29.51
10	849	OK	OK	BB	2⅛	6⅛	29.01
11	847	DAMAGED THREADS - REJECTED	OK		2⅛	6 3/16	29.13
12	GM-3	OK	CRACKED - REJECTED		2⅛	6 3/16	28.89
13	123	OK	OK		2 5/16	6 3/16	29.21
14	342	OK	LEAKING - REFACED - OK		2 5/16	6 3/16	28.98
15	448	CRACKED - G.O. - OK	OK		2 5/16	6⅛	29.43
16	109	CRACKED - G.O. - OK	CRACKED - G.O. - OK		2⅛	6⅛	29.81
17	32	LEAKING - REFACED - OK	CRACKED - G.O. - OK		2⅛	6⅛	29.59
18	X-OVER	OK	4½ XH OK		—	—	—
19	KELLY	4½ XH OK	4½ FH OK		—	—	—
20							
21		NOTE - ALL PICK-UP SUBS	OK				
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SUMMARY

2 PINS & 2 BOXES REJECTED INVOLVING FOUR DRILL COLLARS

3 PINS & 3 BOXES SALVAGED BY GRINDING OUT MINOR CRACKS

2 PINS & 2 BOXES SALVAGED BY REFACING LEAKING SHOULDERS

ALL SHOULDERS REBEVELED AS NEEDED. RUST BAN APPLIED TO ALL JOINTS No. 64868

NOTE: Defects located by Magnaglo and Visual inspection marked on drill collar as follows: CRACKS—RED PAINT OTHER DEFECTS—YELLOW PAINT

NOTE: GO = GROUND OUT BB = BORE BACK RG = RELIEF GROOVE

NOTE TO MACHINE SHOP ON PAINTING OF CRACKED JOINTS: 1. If distance to crack noted on joint, cut off this length. 2. If "rework" noted, cut off 2½" only to clean up crack.

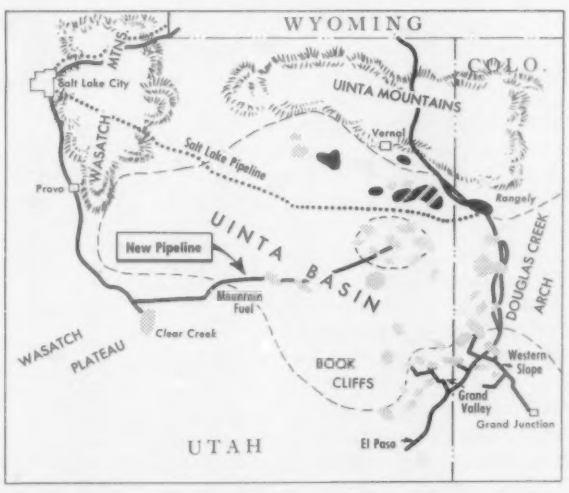
TYPICAL inspection report can be valuable to contractor; the accumulation of these tell which collars and joints last best in a particular area. Reports also may indicate if rig is getting full collar life as it should. Fig. 73.

UINTA BASIN'S BARE LANDSCAPE swallows up a rig gas drilling in the Chapita Wells area. Lack of surface water and slow pace of mud drilling have made gas drilling the preferred mode of operation but formation water seldom allows the well to "dust" as this one is doing.

Uinta basin drillers cut well costs despite uncertainties

... of the seemingly random occurrence of water in formations

BY ED McGHEE
Drilling Editor



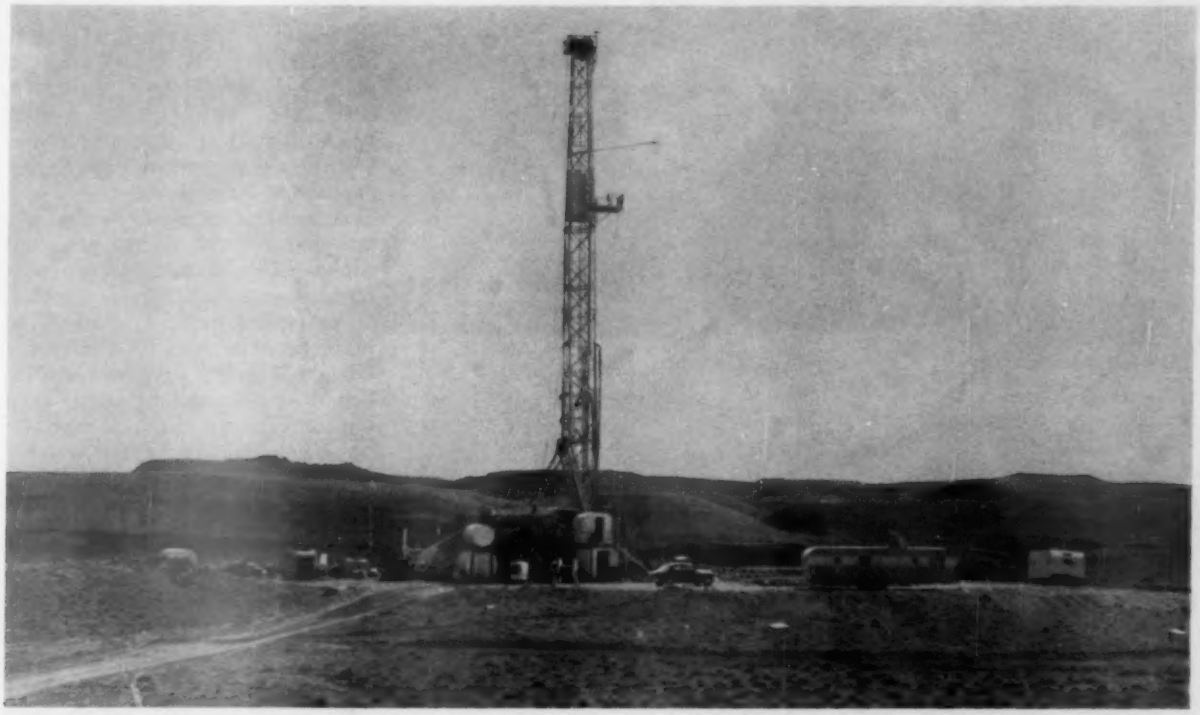
NEW PIPELINE is first market for much of the gas in the central portion of Uinta basin. This market outlet should help stimulate further drilling in the area.

PREDICTING drilling cost accurately is probably harder in Utah's Uinta basin than in almost any other active area of the nation.

Wells directly offsetting may vary 75 to 100% in drilling cost. Moreover, there aren't many direct offsets; drilling has been sparse in much of the basin so that often there's little information on which to make meaningful predictions.

It is a tribute, then, to drilling contractors of the region that they successfully contract most wells, including some wildcats, on a footage basis. It is a further tribute that drilling costs have been reduced almost continuously.

The problem is not that the rocks are harder in some parts of the basin. Nor is crooked hole a great



MUD REPLACES GAS IN HOLE as great volumes of formation water were drilled in this well. When mud is pumped into previously dry hole, shale formations slough off so badly it often takes a week or more of circulating to clean hole enough to continue drilling new hole.

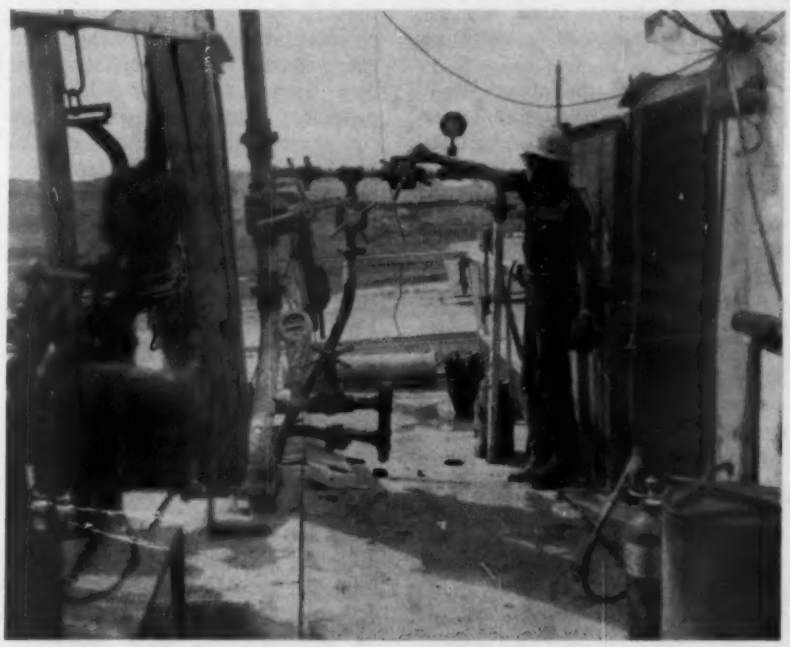
threat. Extreme pressures are unknown. What, then, is the basis for the uncertainty in Uinta? It is seemingly random occurrence of water in a number of the formations. Added to this is the water sensitivity of other formations.

Water can slow, or completely stop, attempts at air or gas drilling. Still, gas and air have proved many times faster and cheaper than straight mud drilling in Uinta. And the water is not found equally on all locations. So drillers are forced by economics to attempt drilling with air or gas on virtually every hole.

Sometimes they succeed in drilling to the top of the pay formation with no sign of water. At other times the hole is flooded at shallow depths by great water flows so that it must be mudded up. And again, some holes find water in small enough volumes that the hole can be "mist drilled" or "aerated-water drilled" (at slower speed) to casing point. Still again, weeping water zones or oil zones go undetected and cause fishing jobs that multiply costs.

Anytime that the contractor must convert to mist drilling, aerated-mud drilling, or slug drilling, the hole goes down more slowly. If the hole must be mudded up, it drills more slowly still. These facts apply equally anywhere. The Uinta basin has an added complication besides: many of the formations are extremely sensitive to water. Here's an example of what this water sensitivity can mean:

A recent Uinta well was gas



GAS-INJECTION RATES ARE BALANCED against water injection in "mist drilling." There must be enough water put in to offset water column in hole annulus. Here driller at Uinta basin development well adjusts gas input with valve on line going into rig standpipe.

FORMATION SAMPLES COLLECTED from the "blooey" line show the predominance of shale in the Green River section commonly drilled in search for gas in the deeper Wasatch formation. Shales are water sensitive, causing many problems in drilling and completing.

drilled until forced to mud up. When filled with fluid, the hole, in the contractor's words, "turned inside out." The walls sloughed off continuously for more than a week. Only after 13 days of reaming and circulating could the contractor get back to bottom and resume drilling new hole.

As a result of the above situations, the drilling contractor must be ready for many eventualities when he spuds a Uinta well. He is forced to take greater responsibility for gas drilling, mist drilling, and aerated-fluid drilling than the contractor in perhaps any other area of the country. Many of the risks normally taken by the operator in other areas fall to the driller in the Uinta basin.

Remoteness extra hindrance. If complex drilling isn't enough by itself, Uinta basin's geography heaps on additional headaches. Headquarters town for the basin—Vernal, Utah—only recently got its first supply store although there has been drilling in Uinta for many years. Much material still must be brought, at great expense in time and money, from points as far distant as Casper, Wyo., and Farmington, N. M.

Terrain is rocky and arid much like that of the Aneth area of southeastern Utah. Only significant quantity of surface water in Uinta basin comes from the White and Green rivers; as a result water hauling and water-well drilling add greatly to over-all drilling cost.

There are few miles of improved roads in the basin. Some locations have been as far as 90 miles from pavement. Bulldozed roads to the rigs are extremely rough, long, and filled with dust holes. It isn't surprising that at least two rigs at this time change crews twice daily by means of airplanes.

Much of the current drilling in the basin is in search for gas. Mountain Fuel Supply Co. is well under way on a pipeline which will carry the basin's fuel to Salt Lake City and Provo. This line is the first market for Uinta's gas and should help stimulate further drilling activity in the region. Few of the already completed gas wells have been produced for any other purpose than to gas drill offsets.

Acreage in Uinta (predominately federal and Indian bases) is held in large blocks, some containing several dozen sections. Both major companies and independent producers are active.

Presently a prime target for these companies is the lenticular gas reservoirs in the Wasatch formation of tertiary age. Today's gas search centers just south of giant Red Wash oil field in the middle of the basin where productive beds lie between 5,500 and 6,500 ft.

A number of other formations are productive of oil and gas. And a tremendous volume of deep beds remains undrilled.

No typical wells. To survey the problems that arise in drilling for Uinta's Wasatch gas, it would be helpful to follow the progress of a typical well. However, the contractor can seldom be certain whether he is going to be gas drilling, mist drilling, slug drilling, mud drilling, or aerated-mud drilling. For this reason, let us take the problems as they might arise on a number of wells spudded simultaneously.

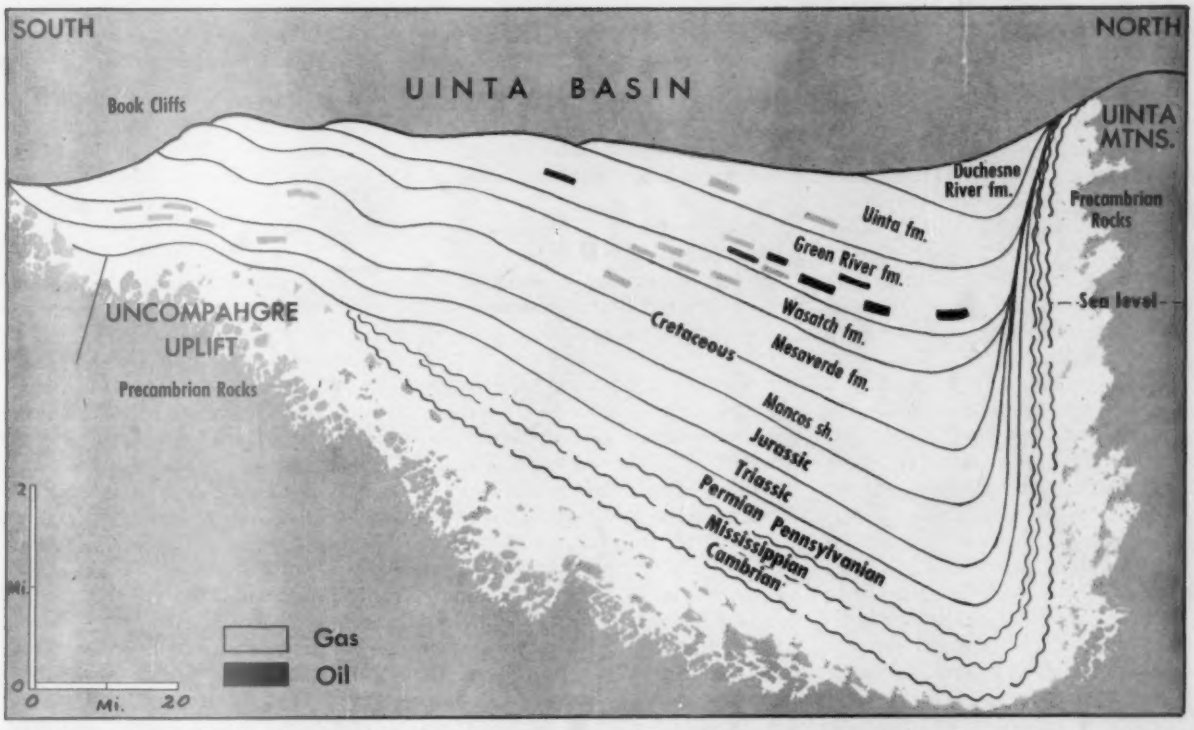
In our group of wells, almost all will be drilling on footage contracts. The operators will have made a road to the site and laid gas lines for fuel and to drill with. On locations too far from a gas well to make a line worth its cost, the operator will have arranged to have air-drilling compressors on the location.

If some operator decides to use mud for drilling, he will supply it. Operators supply water for all locations.

Most of the wells spud into the Uinta formation which is rather hard at the surface. The state requires only some 150 ft. of surface pipe so our surface holes are shallow. Depending on how deep the well is to go and how many casing strings are to be set later, the surface hole may be any size from 10¾ to 16-in. Often surface hole is 15-in. to accommodate a 200-ft. string of 10¾-in. casing.

After the surface pipe has been cemented to surface, most of our rigs will drill out with gas. Surface hole is drilled with water and mud.

As the long hole drills through the Uinta formation and into the Green River, it finds medium to hard drilling in shales, sands, and dolomites. Many of the formations are broken and fractured; as a result the bit runs extremely rough through this section. Also, there is a persistent problem with gage wear on bits drilling the Green River.



WASATCH GAS IS TARGET of much of current drilling in Uinta basin. Geologists are optimistic about potential of other formations and point to great volume of deeper sediments which have not been explored. Gas reserves are difficult to estimate since few completed wells have been produced.

Almost without exception, all the wells gas drill "dusting" to 1,500 or 1,800 ft. At this depth, perhaps three out of four encounter a strong water zone. The one in four which doesn't drill the water can continue at a fast pace. The very few which drill dry all the way to casing point may reach 5,500 ft. in as few as 16 days with 22 bits. Contrast this to the mud-drilled holes, some of which may require 53 bits and 37 days to arrive at the same depth.

Gas use may continue. The water zone at 1,500 to 1,800 ft. doesn't spell an immediate finish to gas drilling. Most wells continue to put gas down the drill string to lift water and cuttings out of the hole. On some wells the return flow may be a full 10-in. stream of salt water. On other wells there may be a big flow of hot (around 100° F.) sulfur water.

Several of our wells may continue to drill as deep as 5,000 ft. thus gas-lifting water out of the hole.

One of the few certainties about Uinta drilling is that on wells where the 1,500 to 1,800-ft. water zone is present, there are the makings of a bad loss-of-circulation problem. While the water zone will make hundreds of barrels of water per day when aerated with gas, the same zone will take great volumes of fluid should the driller attempt to fill the hole with water or mud.

A string of casing is about the only sure way to stop fluid from going into the water zone. At times, all the conventional lost-circulation materials have been tried without success. Even quantities of sage brush pushed down the hole have not stanched the loss of fluid.

Many of the wells which find the 1,500 to 1,800-ft. water also find a strong water flow around 2,600 ft. Unlike the shallower water, the 2,600-ft. zone flows to the surface and may record a good shut-in pressure. Thus on some of our wells we may have a situation where water from the 2,600-ft. zone flows into the hole and back out again at the shallower zone. Such a condition can mean only trouble.

Let us suppose we have the water zone at 1,800 ft. on one of our group of wells and that we have drilled on to 3,000 ft. by injecting gas to lift out water and cuttings. At this point, we have a fishing job. It is then virtually impossible to mud up and fish because we cannot circulate. It's not practical simply to spot mud in the hole; result would be bad sloughing that would stick the fish even tighter. The hole must be circulated in order to clean it out and to fish successfully.

It isn't surprising, then, that the operators on some of our Wasatch gas wells will elect to set a 2,000 to 2,500-ft. string of pipe (either 7 or 8⅝-in.) to case off the trouble-making zone.

Use button bits. As an example of common drilling practices, let us look at the wells which are gas drilling an 8¾-in. hole through the Green River formation. We can expect them to be running eighteen 7-in. collars above an insert-type bit. This bit would be drilling with around 30,000-lb. weight at 50 r.p.m.

Although the shale zones are not extremely hard, they have been found to drill well with insert-type bits. The insert bits are effective, even when water is being injected along with the drilling gas. Bit models selected often have tungsten-carbide inserts on the gage-surface of the cones in order to keep the hole in gage.

Deviation surveys are not taken frequently because the formations are relatively flat and don't lead to bad crooked-hole problems.

"A number of wells have been successfully drilled in with gas."

Inject water with gas. Not all of our group of wells drill strong water zones; and, as we said, such zones are cased off in other wells. As a result, we may sometimes have trouble with holes which make some water (or oil) but not enough to keep the hole clean. On such low-volume zones, the water (or oil) can cause bit cuttings to ball up to a putty consistency.

These balled cuttings collect on the walls of the hole and on the outside of drill pipe and drill collars. As gas continues to flow by these accumulations, the water evaporates away leaving a hard cake or ring. Such cakes may become hard enough and thick enough to stick the pipe; they must be cut off the collars with hatchets. In the hole, these "mud rings" may "take enough weight" to make the driller think he is rotating on bottom.

Uinta drillers have two methods of dealing with such situations. They may put special powders down the drill string. These powders absorb the water and return it to the surface before it can cause trouble.

The other method of handling low-volume water is to inject water along with the drilling gas. The injected water keeps cuttings wet and helps flush them out of the hole. This is mist drilling.

Mist drilling is not the only reason for injecting water along with drilling gas. Consider what happens when one of our Uinta wells has drilled a large-volume water zone. We continue to inject gas to lift this water to the surface. Outside the drill string, we have a column heavy with water. Inside the pipe, we have only a light column of dry gas. Result is that we need an extremely high pressure on the standpipe in order to circulate the well.

This standpipe pressure can be reduced if we inject water along with the gas in order to make the column of fluid inside the pipe heavier. We simply add weight to one side of our U-tube.

Our Uinta drillers strive to inject the maximum amount of gas and the minimum amount of water. When they do, drilling is fastest and hole cleaning most effective. However, there is always a point where we can inject no more gas because more water is necessary to keep circulating pressure down. Maintaining this balance is a continuous job which can't be calculated ahead of time.

Usual practice is for gas flow to be wide open. Then water volume is regulated accordingly. Pressure and volume of gas from the supply wells is usually regulated to about 600 psi.

Injected water comes from the ponds which hold the fluid produced from the hole. Rig pumps with small liners inject the water along with foamers into the standpipe. By "splitting the compound," the driller can operate his pump at slow speed (from 15 to 40 r.p.m.) to deliver perhaps 60 to 175 g.p.m. of water.

Gas flow may reach 5 M.M.c.f.d. while mist drilling; it may be as little as 1½ M.M.c.f.d. when the 7⅞-in. hole is dusting. When large volumes of water are being injected, gas flow varies between those two extremes.

A number of Uinta wells have drilled shallow gas zones. If flow is strong enough, it is usually necessary to mud up the hole.

Drilling with mud. When a hole is converted to mud, there is an immediate problem with sloughing, "heaving," and bridging in the shale section. There may be a delay of 1 to 2 weeks from the time mud is pumped into the hole until the bit can get back to bottom to resume drilling. Of course, the hole becomes so badly out of gage, it is seldom possible to circulate the mud fast enough to effectively clean the annulus.

It's likely that the same overgage condition exists when mist drilling or otherwise injecting water with the drilling gas. However, the turbulence in the hole annulus and the fast return velocity help keep cuttings moving out of the hole.

Wells which mud drill from top to bottom don't have the delay associated with mudding up a gas-drilled hole. However, where gas drilling may cut the hole at 2 or 3 minutes per foot, mud drilling may require 8 minutes per foot. Moreover, bit life may be cut in half with mud.

A number of mud types have been tried to cut down on hole sloughing. None has been outstandingly successful.

Moreover, attempts to drill with mud are faced with the strong possibility of total loss of circulation.

Into the Wasatch. Formations in the lower Green River drill more smoothly and with fewer problems than shallower beds. Once the top of the Wasatch is drilled (at about 5,000 ft.), many of our group of wells will set 7-in. pipe before continuing. The intermediate casing is good protection in preparing for the problems that inevitably arise in drilling through and completing the pay sands.

Most wells drill out below the 7-in. with a 6¼-in. bit so that a 4-in. liner may be set for production.

The red shales of the Wasatch are unstable when drilled with mud, even mud of low water loss and containing oil emulsion. Still, most operators are reluctant to drill the pay with gas because of the added danger associated with high gas flows. A number of wells have been drilled in successfully with gas; these wells are generally credited with uncovering pay zones which might have been overlooked had mud been used. Most operators now feel they have good enough control to find such pay zones from logs of the mud-drilled holes.

Time to drill the 1,000 ft. or so of Wasatch varies from as little as 3 days with "gaseated" mud to as much as 5 days with mud.

Completing the wells is often as time-consuming and expensive as drilling them. The same characteristics that make the Wasatch difficult to drill also make it hard to get a good seal on the liners and to treat the zone for production. The one "barefoot" completion of the zone proved unsuccessful when the hole bridged over, shutting off production shortly after completion.

Acknowledgment

The author thanks Tom Gipson, of Calvert Exploration Co., Vernal, Utah, for supplying much of the information contained in this article.

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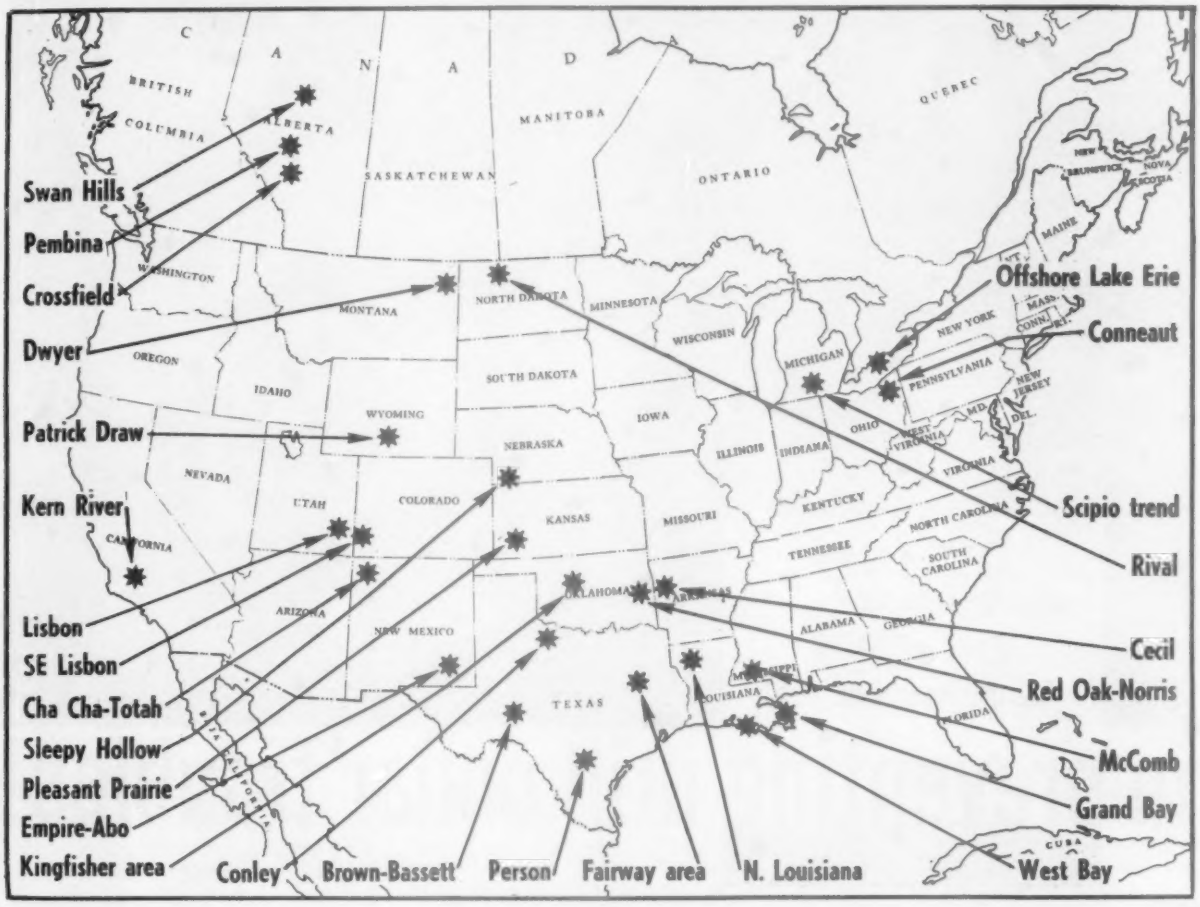
Some are carryovers, in this Journal review of...



Where drilling is most active

BY PETER B. BIKE
Staff Editor

HERE'S A GUIDE to the active drilling areas in North America. The costs and other factors in this report are intended to represent average conditions for the respective areas.

Who's responsible for providing these data? Nearly 200 operating firms and individuals were surveyed to present the cost figures as they saw them. It was interesting to note that not only was the response good, but that different operators working in the same area were not experiencing the same breakdown in costs. One might pay a higher footage rate, or more to put a well on pump, but there was a marked similarity in total expenditures. Where a firm encountered unusual difficulties, such as rough drilling or lost-circulation problems, it tended to note these harassing considerations, but included only those costs which were truly representative for an average well in the field.

It is apparent that drilling sites are becoming more selective. Success ratios in total effort, both development and stepouts, are notably improved over previous years. Undoubtedly this is due to the operators being more judicious about what they will and won't drill.

The old and the shallow areas are seemingly getting more attention. Last year and the year before, the big attraction was Green County, Kentucky, and environs. "Blue Grass fever" has abated. Operators still interested in reasonable returns at shallow depths have turned to other pastures. Some good shallow targets now sought are found in West Virginia and North Louisiana, while Offshore Lake Erie and Northeast Ohio are enjoying continued investigation.

In an annual report of this type, there are always new areas and new names. Yet, some of the old standbys continue to draw the bulk of the effort.

Let's check some of the areas

These are the fields and areas covered in this report

ALASKA
Swanson River.
ARKANSAS
Stamps Area.
ARKOMA BASIN
Cecil, Red Oak.
CALIFORNIA
Arbuckle, Kern River, McMullin Gas, Midway, Summerland.
COLORADO
Divide Creek, McClave, Midway, Southeast Lisbon.
KANSAS
Pleasant Prairie.
LOUISIANA
Black Bay, Block 24, Grand Bay, Hollywood, Lake Pelto, Lake Washington, Minden, Quarantine Bay, West Bay.
MICHIGAN
Scipio Trend.
MISSISSIPPI
McComb.
MONTANA
Dwyer, Soap Creek, Stensvad.
NEBRASKA
Ackman.
NEW MEXICO
Allison, Blanco, Cha Cha, Horseshoe Canyon, Langlie-Mattix, Maljamar, Verde - Horseshoe Canyon, Totah.
NORTH DAKOTA
Blue Buttes, Clear Creek, Glenburn, Rival.
OHIO
Conneaut.
OKLAHOMA
Enville, Hugoton, Kingfisher County, Laverne Area, Mocane, Moore Area, Noble Area, Northeast Cheyenne Valley, Northeast Gibbon Spur, North Okarche, Northwest Okeene, Payne Area, Southeast Marietta, Shattuck Area, Sho-vel-tum, Valley Center.
EAST TEXAS
Bethany-Longwood, Northeast Bethany, Bryans Mills, Fairway Area, New Hope, Southeast Fruitville, Triz Liz, Wright Mountain.
NORTH TEXAS
Boonesville, Conley, New Mag-Oil Creek.
SOUTH TEXAS
Lopeno, Palacios Area, Person, South Red Fish Reef.
WEST TEXAS
Bakke, Blackstone-Slaughter, Brown-Bassett, Foster, Fullerton, Howard Glasscock, McElroy, North Cowden, Penwell, Puckett Rojo Caballos, TXL - Tubb, TXL - Wolfcamp (North), University-Waddell, Wasson.
UTAH
Aneth Area, Red Wash.
WYOMING
Big Piney, Dead Horse Creek, La-Barge, Miller Creek, Patrick Draw, Raven Creek, Rozat, West Desert Springs.
CANADA
Caroline - Garrington, Crossfield, Pembina, Swan Hills, Waterton Park, Fort Nelson, Offshore Lake Erie.

that are playing to a full house:

West Virginia. In the north-central sector of the state, Lewis and Braxton counties are providing the action. The big attractions are the Upper Devonian-Chemung zone found at 4,150 to 4,300 ft. in Braxton County and the Big Injun sand in the Pocono zone of the Mississippian in Lewis County. The latter is found at 2,100 ft. and is 45 ft. thick.

Average cost for drilling a Benson well is $45,000 while Big Injun wells average $20,000. Payouts are good, too. Normal procedure is to fracture the pays in both sectors. Yield on the Injun wells can be increased 400% after fracture treatment. The Benson-sand wells are less spectacular although they show an average of 12% return the first year. Life of the wells varies from 8 to 10 years. The Injun wells have a longevity of 12 to 18 years. Leasing activity in the state has been very lively both by independents and majors. An interesting sidelight is that although some farmouts have been made, this procedure isn't widespread.

North Louisiana. Here is an area of mixed emotions. Long an independent stronghold, some major firms—notably Pan American and Texaco—are vying with the small firms for some choice production. There are few areas in the country that have received the continued interest of this seemingly ageless area. In Caddo Parish, 30 miles north of Shreveport, Caddo field has been combined with Pine Island and recent completions have been chalked up at steady rate of 15 to 20 every week.

Fracture treatment is one of the prime factors in making this 55-year-old area still attractive. What's more, there are nearly a dozen pays found above 3,500 ft. Although they go on the pump shortly after completion, the 7,000 wells that have been drilled since the field was opened in 1906 show the faith that operators still have in the area.

The targets sought include: Nacatoch sand 900-1,050 ft.; Annona chalk 1,300-1,700 ft.; Austin chalk 1,000-1,100 ft.; Blossom sand 1,800-1,860 ft.; Woodbine sand 2,000-2,100 ft.; Washita-Fredericksburg 2,200-2,300 ft.; Paluxy sand 2,760-2,800 ft.; and Rodessa 2,975-3,025 ft. Until recently, a dry hole was almost unheard of here. Lately there have been more than usual abandonments, but the success ratio is high.

About 65 miles south of Shreveport, a relatively new area is shaping up to the point that two adjacent fields—Pendleton and Many—are likely to join as a single field. A dozen completions a week have been reported and no sign of letup is seen. These wells are not very deep and the prime pay is Upper Cretaceous-Sara, just above the base of the anhydrite, at 2,800-3,300 ft.

The wells are good, too. Most of them are flowing and initial production varies from 56 to 208 bbl. per day of 41°-43° oil. Again, the independents have a strong toehold, with Shell the only major active in the campaign.

Edwards trend. One of the longest and more prolific trends in North America is the Edwards trend which extends from the Rio Grande in Southwest Texas toward East Texas and may sweep east across Louisiana.

There are at least 16 proved fields (OGJ, Aug. 21, 1961, p. 72) along this belt. Types of traps vary

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from reefs to salt domes to simple structures complicated with faulting. Shell is wildcatting along the northeast extention of the trend in effort to find new reserves. An interesting aspect of this regional play is the high interest in seeking geophysical options in effort to pace future drilling.

Although the Edwards is the leading target, the pre-Edwards section may heighten the campaign for deeper drilling. Other likely commercial objectives are the Trinity rocks—Paluxy, Rodessa, Pettet, and Travis Peak. Below these Lower Cretaceous beds, the Jurassic and deeper sections may be sought.

How far the Edwards trend will extend to the northeast is anybody's guess. Rest assured that more drilling will be done to determine the best locations and optimum depths for new reserves bound to come.

Tule Creek. Up Montana way, one of the drillers delights and dilemmas is this puzzler of Williston basin in Roosevelt County. What started out as a smashing victory for the oil finders, turned out to be more like a captured lion. To bear down or turn loose was an acute problem after the spectacular discovery was followed by a dismal dry hole on the first offset ½ mile east of the pool opener. Nor was this the last of it. Later wells alternated spasmodically between successes and failures with monotonous repetition. The pattern was almost unpredictable.

Despite the adversities, Tule Creek may still shape up as a good find (OGJ, Feb. 6, p. 171, and May 29, 1961, p. 206). At last report there were still a few rigs working in the area.

Sleepy Hollow area. One of the most wide-awake sectors of Southwest Nebraska, this Red Willow County play is spreading in all directions. What started as a singular pool to the west at Ackman field, has spilled over into several fields which now comprise the Sleepy Hollow area. Following discovery of dual pays in the Pennsylvanian Lansing-Kansas City and the controversial Cambrian-Reagan (some consider the lower pay as basal Pennsylvanian or Des Moinesian-Cherokee), the area now has a dozen and a half active rigs. Further details were presented in the Journal article of May 8, 1961, p. 128.

Generally, the prolific pays are found at depths around 3,500 ft. and have a fast payout. Costs are good, to. A dry hole can be drilled for $14,00 and a pumping well is completed for $42,000. Estimated recovery is 100 bbl. per acre-ft. for the Lansing, and the per well averages are 50,000 bbl. for Lansing, and 200,000 to 250,000 bbl. for Reagan wells.

A fast look. Elsewhere in North America, Swanson River in Alaska rolls along. This attractive find undoubtedly will be joined by other development programs. One of these, the Kenai gas field, is due to start further development after being shut in awaiting pipeline facilities. The Copper River basin in eastern Alaska is one of the most promising provinces for a strike that is yet to be found and developed.

The Fort Nelson area in Northeast British Columbia proves that the drill will go where the rewards are. This area is covered in the following reports. A still more distant jumping-off place is the anticipated exploration program slated for the Arctic Islands in Canada's Far North.

Lisbon field in Southeast Utah is still developing (OGJ, Jan. 23, 1961, p. 134). The entire Paradox basin shows signs of warranting further attention. To the south, Empire-Abo trend of Southeast New Mexico is one of the hottest areas in the nation. For a full report see June 19, 1961 issue of the Journal, p. 157. If this area does develop as indicated, the Abo trend will provide some fine new production in the West Texas counties of Gaines, Yoakum, Terry, and Hockley. This is far from the trend's western extremity in Eddy County, New Mexico.

For the details of specific drilling areas in the rest of the U. S. and Canada, check the reports which follow.

Drilling data on active areas

Alaska

SWANSON RIVER, Kenai Peninsula.
Pay: Lower Tertiary Hemlock-Eocene. Total depth 11,500 (average).
Costs: Flowing well $550,000. Dry hole $450,000. Day-work rate with pipe $1,900.
Rig time: 100% on day-work rate. Total days 36. Total bits 60.
Casing: 13⅜-in. surface casing set at 3,000 ft. with 2,000 sacks of cement. 7-in. oil string set at 12,000 ft. with 600 sacks of cement.
Mud: Emulsion, 12.7 lb. per gal.
Core data: 11,150-11,700 ft., 0-3.275 md. perm., 15-25% porosity.

Arkansas

STAMPS AREA, Lafayette County.
Pay: Ford zone of Smackover. Total depth 8,130 ft.
Costs: Flowing well $126,000. Dry hole $62,000 Footage price $4.50. Day-work rate with drill pipe $650 and without pipe $600.
Rig time: 75% on footage rate. 25% on day rate. Total days 40. Total bits 33.
Casing: 8⅝-in. surface casing set at 1,000 ft. with 700 sacks of cement. 5½-in. oil string set at 8,100 ft. with 575 sacks of cement.
Mud: Gel, 200 sacks; Barite, 700 sacks; thinner, 100 sacks; starch, 30 sacks.
Tops: Hosston at 3,910 ft.; Cotton Valley 5,990 ft.; Buckner 7,860 ft.; Ford at 8,110 ft.
Core data: Ford zone, 4 ft. thick; 603 md. perm.; 18.3% porosity; 2.1% resid. oil sat.; 14.5% total water sat.; gas-condensate drive.

CECIL, Franklin County, Arkansas
Pay: Morris sand, Casey sand, Dunn series, Hale sand, five other minor sands. Total depth 5,400 ft.
Costs: Flowing well $105,000. Dry hole $67,000. Day-work rate with pipe $650 and without pipe $600 (cable-tool day work $300).
Rig time: 100% day-work rate. Total days: 15 rotary, 60 cable tools. Total bits five.
Casing: 13⅜-in. surface casing set at 500 ft. with 250 sacks of cement. 10¾-in. intermediate at 2,700 ft. with no cement. 5½-in. oil string at 5,500 ft. with 250 sacks of cement. 10¾-in. recovered prior to setting 5½-in.
Mud: Used only to run casing and logs.
Tops: Morris at 2,200 ft.; Casey at 3,700 ft.; Dunn series at 4,200 ft.; Hale at 5,300 ft.
Estimated recovery in M.c.f. per acre-ft.: Hale 350.

RED OAK-NORRIS, Latimer and LeFlore counties, Oklahoma.
Pay: Red Oak and Spiro sands of Atoka age. Total depth 12,500 ft.
Costs: Flowing well $420,000. Dry hole $210,000. Day-work rate with pipe $1,000 and without pipe $925.
Rig time: 100% day-work rate. Total days 120. Total bits 50.
Casing: 16-in. conductor set at 200 ft. with 300 sacks of cement. 10¾-in. surface casing set at 2,000 ft. with 900 sacks of cement. 7⅝-in. intermediate set at 8,000 ft. with 1,400 sacks of cement. 5-in. liner set at 11,800 ft.
Mud: Gas drilling to Red Oak, then mud.
Tops: Hartshorne at 1,700 ft.; Atoka shale at 1,950 ft.; Red Oak at 7,500 ft.; Spiro at 11,500 ft.; Wapanucka lime at 11,750 ft.
Core data: Red Oak, 7,500-7,640 ft. interval, 0.6 md. perm., 15% porosity, 21% total water sat. Spiro, 11,500-11,570

ft. interval, 2.3 md. perm., 9% porosity, 30% total water sat. Estimated recovery in M.c.f. per acre-ft.: Red Oak 725. Spiro 650.

California

ARBUCKLE, Sacramento Valley.
Pay: Cretaceous "F" zone. Total depth 6,700 ft.
Costs: Flowing well $100,000. Dry hole $60,000. Footage price $3.35. Day-work rate with pipe $470. Without pipe $450.
Rig time: 75% on footage rate; 25% on day-work rate. Total days 25. Total bits 13.
Casing: 9⅝-in. set at 1,900 ft. with 700 sacks of cement. 5½-in. set at 6,000 ft. with 350 sacks of cement.
Mud: Weight material, 1,350 sacks; gel, 60 sacks; fluid-loss agents, 15 sacks; caustic, 5 drums; quebracho, 25 sacks.
Tops: Cretaceous "F" zone, 4,000 to 6,000 ft.
Estimated recovery: 65-85% of gas in place. Gas expansion reservoir.

KERN RIVER, Kern County.
Pay: Kern River series. Total depth 1,048 ft.
Costs: Well on pump $14,300. Dry hole $9,200. Footage price $1.67. Day-work rate with pipe $852 and without pipe $828.
Rig time: 95% on footage rate; 5% on day-work rate. Total days 1.6. Total bits 1½.
Casing: 8⅝-in. set at 686 ft. with 284 sacks of cement. 6⅝-in. per liner (average length of liner 395 ft.).
Mud: Clay-water, 70 lb. Lease crude used from shoe of 8⅝-in. casing to total depth.
Tops: Upper Plicene at 758 ft.
Estimated recovery: 252 bbl. per acre-ft.

McMULLIN GAS, San Joaquin County.
Pay: Upper Cretaceous. Total depth 6,000 ft.
Costs: Flowing well $65,000. Dry hole $30,000. Footage price $2.20. Day-work rate with pipe $1,008 and without pipe $960.
Rig time: 80% on footage rate. 20% on day-work rate. Total days 10. Total bits 11.
Casing: 7-in. surface set at 500 ft. with 150 sacks of cement. 4½-in. oil string set at 6,000 ft.
Mud: Weight material, 5 tons; gel material, 5 tons.
Subsea tops: Lower Blewett at 5,250 ft.; upper Tracy at 5,930 ft.

MIDWAY, Kern County.
Pay: Tulare and Potter sands. Total depth 1,100 ft.
Costs: Well on pump $31,000. Footage price $28.10.
Rig time: 75% on footage rate. 25% on day-work rate. Total days 2.
Casing: 12¼-in. surface casing set at 150 ft. with 150 sacks of cement. 8⅝-in. oil string set at 850 ft. with 400 sacks of cement. 6⅝-in. hung liner at 400 ft.
Tops: Tulare at 725 ft.; Potter at 800 ft.

SUMMERLAND, offshore Santa Barbara County.
Pay: Not disclosed. Total depth 8,500 ft.
Costs: Flowing well $410,000, excluding platform cost. Footage price $50.60.
Rig time: 79% on footage rate; 21% on day-work rate. Total days 48.
Casing 18-in. surface pipe set at 345 ft. with 465 sacks of cement. 10¾-in. intermediate set at 3,405 ft. with 1,200 sacks of cement. 7-in. oil string set at 8,500 ft. with 600 sacks of cement.
Mud: Clay-water-emulsified asphalt, 75 to 85 lb. per cu. ft.
Tops: Approximate depth, 8,500 ft.

Colorado

DIVIDE CREEK, Mesa County.
Pay: Mesaverde sandstone. Total depth 4,800 ft.
Costs: Flowing well $90,000. Dry hole $55,000. Footage price $9.00. Day-work rate without drill pipe $925. 1½ cents per foot per day drill-pipe rental.
Rig time: 100% day-work rate. Total days 30. Total bits 17.
Casing: 8⅝-in. surface casing set at 350 ft. with 200 sacks of cement. 4½-in. oil string set at 4,800 ft. with 350 sacks of cement.
Tops: Mancos shale at 4,790 ft.
Core data: Estimated recovery: 300 M.c.f. gas per acre-ft.

McCLAVE, Kiowa County.
Pay: Morrow. Total depth 5,000 ft.
Costs: Flowing well $70,000. Dry hole $52,000. Footage price $4.35. Day-work rate with pipe $550 and without pipe $400.
Rig time: 90% on footage rate; 10% on day-work rate. Total days 22; total bits 25.
Casing: 9⅝-in. surface casing set at 400 ft. with 225 sacks of cement. 5½-in. oil string set at 4,000 ft. with 260 sacks of cement.
Mud: Gel mud, 9.3 lb. per gal.; 50 cc. visc.; 5 cc. water loss; 8% oil. Cost $3,300.
Tops: Stone Corral at 2,050 ft. Marmaton at 4,050 ft.; Cherokee at 4,200 ft.; Morrow at 4,650 ft.; Mississippi at 4,950 ft.

MIDWAY, Baca County.
Pay: Topeka (gas only). Total depth 3,400 ft.
Costs: Flowing well $30,000. Footage price $2.75. Day-work rate with pipe $650 and without pipe $600.
Rig time: 90% on footage rate. 10% on day-work rate. Total days 9. Total bits 9.
Casing: 8⅝-in. surface casing set at 450 ft. with 250 sacks of cement. 2⅞-in. oil string set at 3,250 ft. with 100 sacks of cement.
Mud: Native mud with 10% oil; salt gel and starch, 50 and 40 sacks; cotton seed hulls, 100 sacks.
Tops: Base Stone Corral at 1,488 ft.; Top Neva at 2,628 ft.; Top Topeka at 2,990 ft.
Estimated recovery: Topeka 100 cu. ft. per acre-ft.

S. E. LISBON, San Miguel County.
Pay: Mississippian. Total depth 9,800 ft.
Costs: Flowing well $300,000. On pump $315,000. Dry hole $230,000. Footage price $11. Day-work rate with pipe $1,050 and without pipe $1,000.
Rig time: 70% on footage rate;; 30% on day-work rate. Total days 135. Total bits 80.
Casing: 13⅜-in. surface casing set at 650 ft. with 400 sacks of cement. 9⅝-in. intermediate set at 3,000 ft. with 900 sacks of cement. 5½-in. oil string set at 9,800 ft. with 700 sacks of cement.
Mud: Salt, 3,000 lb.; caustic, 200 lb.; lignosulfonate, 100 lb.; oil. 3-6 bbl.; soda ash, 50 lb.
Tops: Mississippian at 8,750 ft.; Ouray at 9,000 ft.; Elbert at 9,100 ft. and McCracken at 9,200 ft.

Kansas

PLEASANT PRAIRIE, Haskell County.
Pay: Mississippian. Total depth 5,150 ft.
Costs: Flowing well $65,000. On pump $75,000. Dry hole $35,000. Footage price $4.50. Day-work rate with pipe $650 and without pipe $600.
Rig time: 80% on footage rate. 20% on day-work rate. Total days 15. Total bits 19.
Casing: 8⅝-in. surface casing (24 lb.) set at 800 ft. with 400 sacks of cement. 5½-in. oil string (14-15 lg.) at 5,200 ft. with 650 sacks of cement. Two-stage cement job was run on oil string through the Hugoton series.
Mud: Hulls, 900 lb.; soda ash, 25 lb.; lime, 200 lb.; caustic soda, 600 lb.; quebracho, 2,000 lb.; mud filter, 80 lb.
Tops: Lansing-Kansas City at 4,300 ft.; Marmaton at 4,600 ft. Morrow at 5,000 ft.; Mississippi at 5,100 ft.
Core data: Mississippi B-Zone, 75 ft. interval; 2.3 md. perm.; 10.2% porosity; 64% resid. oil sat.; 32.4% total water sat.; Mississippi C-zone; 10.5 ft. interval; 130.0 md. perm., 12.8% porosity; 54% resid. oil sat.; 42.3% total water sat. Estimated recovery bbl. per acre-ft.; B-zone 84; C-zone 90. Gas expansion.

Louisiana

BLACK BAY, Plaquemines Parish.
Pay: Miocene, 7,100-9,200 ft. Total depth 9,300 ft.
Costs: Dual flowing well $170,000. Dry hole $84,000. Footage price $2.75. Day-work rate with pipe $1,400 and without pipe $1,300.
Rig time: 66% on footage rate. 33% on day-work rate. Total days 9. Total bits 5.
Casing: 10¾-in. surface casing set at 2,000 ft. with cement to surface; 7-in. oil string set at 9,300 ft. with 500 sacks of cement.
Mud: Barite, 16,900 lb.; gel, 14,750 lb.; lignosulfonate, 7,125 lb.; caustic, 4,100 lb.; sodium cerbo. cellulose, 150 lb.
Tops: Miocene at 7,100 ft., 7,400 ft., 8,575 ft., and 9,200 ft.
Core data: 7,100 ft., 27% porosity; 7,400 ft., 33.4% porosity; 9,200 ft., 29% porosity. Estimated recovery bbl. per acre-ft.: 7,100 ft., 503; 7,400 ft., 628; 8,575 ft., 455; 9,200 ft., 692. Water drive.

BLOCK 24, South Pass Area.
Pay: Upper Miocene sands. Total depth 8,000 ft.
Costs: Flowing well $115,000. Dry hole $75,000. Footage price $3. Day-work rate with pipe $1,400 and without pipe $1,300.
Rig time: 75% on footage rate. 25% on day-work rate. Total days 10. Total bits 6.
Casing: 10¾-in. surface casing set at 1,800 ft. with 900 sacks of cement. 7-in. oil string set at total depth with 500 sacks of cement.
Mud: Weighting material, 2,000 sacks; gel, 200 sacks; quebracho, 100 sacks; clay, 150 sacks; SAPP, 20 sacks; caustic, 4,000 lb.
Tops: N-4 at 7,200 ft.; P at 7,800; Q at 8,000; T at 9,300.
Core data: Upper Miocene sands, 300 md. perm.; 32% porosity; 15% resid. oil sat.; 75% total water sat. Estimated recovery: 500 bbl. acre-ft. gas expansion and 800 bbl. per acre-ft., water drive.

GRAND BAY, Plaquemines Parish.
Pays: 8,500 and 7,500 ft.

Costs: Flowing well $121,000. Dry hole $80,000. Footage price $2.50. Day-work rate with pipe $1,400 and without pipe $1,250.
Rig time: 85% on footage rate. 15% on day-work rate. Total days 8. Total bits 5.
Casing: 10¾-in. surface casing set at 2,000 ft. with 1,200 sacks of cement. 7-in. oil string set at 8,550 ft. and 7,550 ft. with 500 sacks of cement.
Mud: Barite, 85 sacks; gel, 22 sacks; quebracho, 78 sacks; gyp, 100 sacks; caustic, 46 sacks; CMC, 15 sacks.
Tops: Upper Miocene 8,450 and 7,450.

HOLLYWOOD AREA, Terrebonne Parish.
Pay: Upper Krumbhaar. Total depth 12,400 ft.
Costs: Flowing well $270,000. Dry hole $150,000. Footage price $4.00; Day-work rate with pipe $1,200 and without pipe $1,100.
Rig time: 70% on footage rate. 30% on day-work rate. Total days 31. Total bits 12.
Casing: 16-in. surface casing set at 200 ft. with 205 sacks of cement. 10¾-in. intermediate set at 3,000 ft. with 1,200 sacks of cement. 7-in. oil string set at 12,400 ft. with 650 sacks of cement.
Mud: Gel and clay, 48 sacks; barite, 2,640 sacks; gel, 129.
Tops: 10,580-ft. sand at 10,650 ft., "O" sand at 11.170 ft., "P" sand at 11,230 ft., and Upper Krumbhaar at 12,190 ft.
Estimated recovery: 900 M.c.f. per acre-ft. Gas expansion.

LAKE PELTO, Terrebonne Parish.
Pay: 10,700-ft. sand. Total depth 13,224 ft.
Costs: Flowing well $253,186. Dry hole $195,000. Footage price $5.00. Day-work rate with pipe $1,700 and without pipe $1,550.
Rig time: 28% on footage rate. 72% on day-work rate. Total days 50. Total bits 23.
Casing: 16-in. surface casing set at 136 ft. with 150 sacks of cement. 10¾-in. intermediate set at 2,032 ft. with 1,100 sacks of cement. 5½-in. oil string set at 10,797 ft. with 500 sacks of cement.
Mud: Low-pH mud. Maximum mud weight, 13 lb. Mud cost $24,320. Chemical cost $6,045.
Tops: 10,700-ft. sand, at 10,716-10,724 ft.
Core data: 10,700-ft., 10,719 interval, 102 md. perm., 30.1% porosity, 11.8% residual oil sat., 62.5% total water sat. Estimated recovery: 350 bbl. per acre-ft. Water drive.

LAKE WASHINGTON, Plaquemines Parish.
Pay: Shallow east flank Miocene sands. Total depth 3,000 ft.
Costs: Day-work rate with pipe $940 and without pipe $870.
Rig time: 70% on footage rate. 30% on day-work rate. Total days 10. Total bits 3.
Casing: 7-in. surface casing set at 150 ft. 2½-in. oil string set at 3,000.
Mud: Natural normal-weight mud.
Tops: D sand at 2,600 ft.
Core data: D sand, 73-ft. net sand interval; 1,000 md. perm., 30% porosity; 78% resid. oil sat.; 22% total water sat.

MINDEN (West Side), Webster Parish.
Pay: Rodessa (oil) and James (gas). Total depth 6,900 ft.
Costs: Flowing well $106,000. On pump $120,000. Dry hole $60,000. Day-work rate with pipe $775 and without pipe $700.
Rig time: 100% on day-work rate. Total days 44. Total bits 23.
Casing: 9⅝-in. surface casing set at 1,000 ft. with 575 sacks of cement. 7-in. oil string at 6,900 ft. with 600 sacks of cement.
Mud: Gel. 9,600 lb.; clay, 3,000 lb.; quebracho, 2,800 lb.; caustic soda, 1,800 lb.; barites, 20,000 lb.; CMC, 100 lb.; lignite 900 lb.
Tops: Nacatoch at 3,000 ft.; Lower Cretaceous at 5,800 ft.; Rodessa at 6,400 ft. James at 6,800 ft.

MINDEN (East Side), Webster Parish.
Pay: Paluxy. Total depth 7,700 ft.
Costs: Flowing well $100,000. Dry hole $68,000. Footage price $6.25. Day-work rate with pipe $775 and without pipe $700.
Rig time: 100% on footage rate. Total days 28. Total bits 25.
Casing: 9⅝-in. surface casing set at 1,000 ft. with 575 sacks of cement. 5½-in. oil string at 7,600 ft. with 1,000 sacks of cement.
Mud: Gel, 3,000 lb.; clay, 1,800 lb.; CMC, 400 lb.; quebracho, 3.300 lb.; caustic soda, 2,200 lb.; barite, 400 lb.
Tops: Nacatoch at 3,100 ft., Lower Cretaceous at 5,900 ft., Paluxy at 6.600 ft., Mooringsport at 7,600 ft.

QUARANTINE BAY, Plaquemines Parish.
Pay: 8,100-9,500 ft. Total depth 8,800 ft.
Costs: Dual flowing well $160,000. Dry hole $75,000. Footage price $2.50. Day-work rate with pipe $1,400 and without pipe $1,300.
Rig time: 66% on footage rate. 33% on day-work rate. Total days 8. Total bits 5.
Casing: 10¾-in. surface casing set at 2,000 ft. with 40 sacks of cement. 7-in. oil string set at 8,800 ft. with 500 sacks of cement.
Mud: Weight, 16,500 lb.; clay and gel, 5,600 lb.; lignosulfonate, 6,200 lb.; caustic, 4,600 lb.; CMC, 600 lb.
Tops: Miocene at 8,160 ft., 8,500 ft., 9,400 ft.. and 9,500 ft.
Estimated recovery barrel per acre-ft.: 8,1600 ft., 600; 8,500 ft., 750; 9,400 ft., 900; 9,500 ft., 800. Water drive.

WEST BAY. Plaquemines Parish.
Pay: Miocene, 7,600-11,000 ft. Total depth 8,800 ft. (average).
Costs: Dual flowing well $160,000. Dry hole $75,000. Footage price $2.50. Day-work rate with pipe $1,400 and without pipe $1,300.
Rig time: 66% on footage rate. 33% on day-work rate. Total days 8. Total bits 5.
Casing: 10¾-in. surface casing set at 2,500 ft. 7-in. oil string set at 8,800 with 500 sacks of cement.
Mud: Weight, 86,800 lb.; lignosulfonate, 12,750 lb.; caustic, 4,000 lb.; CMC, 150 lb.; gypsum, 14,200 lb.
Tops: Miocene at 7,600 ft., 9,350 ft., and 11,000 ft.
Estimated recovery bbl. per acre-ft.: 7,600 ft., 1,042; 9,350 ft., 931; 11,000 ft., 863. Water drive.

Michigan

SCIPIO TREND, Calhoun, Jackson, Hillsdale counties.
Pay: Trenton-Black river. Total depth 4,200 ft.
Costs: Flowing well $60,000. On pump $68,000. Dry hole $34,000. Footage price $5.50. Day-work rate with pipe $750 and without pipe $650.
Rig time: 18 days footage rate. 3 days day-work rate. Total days 21. Total bits 16.
Casing: 16-in. surface casing set at 300 ft. with 250 sacks of cement. 10-in. or 8-in. intermediate set at 1,000 with 550 sacks of cement. 5½-in. or 7-in. oil string set at 4,200 ft. with 150 sacks of cement.
Mud: Bentonite, oil, and chemical. Average cost $2,000.
Tops: Traverse at 1,425 ft., Niagara at 2,600 ft., and Trenton at 3,750 ft.
Core data: Estimated recovery in Trenton: 125 bbl. per acre-ft.; probably both gas expansion and water drive.

Mississippi

KNOXO. Marion County.
Pay: Washita-Fredericksburg sand. and Paluxy. Total depth 13,400 ft.
Costs: Flowing well $320,000. Dry hole $150,000. Footage price $6.30. Day work with pipe $1,200 and without pipe $1,100.
Rig time: 70% on footage rate. 30% on day-work rate. Total days 70. Total bits 45.
Casing: 10¾-in. surface casing set at 2,200 ft. with 1,400 sacks of cement. 7-in. oil string set at 13,150 ft. with 1,500 sacks of cement. 16-in. set at 60 ft. with 150 sacks of cement.
Mud: Native with 10% oil.
Tops: Lower Tuscaloosa at 9,300 ft.; Washita-Fredericksburg sand at 12,000 ft.; Paluxy at 12,100 ft.

McCOMB, Pike County.
Pay: Lower Tuscaloosa. Total depth 10,920 ft.
Costs: Flowing well $100,000. Well on pump $120,000. Dry hole $70,000. Footage price $3.55. Day-work rate with pipe $1,025 and without pipe $975.
Rig time: 88% on footage rate. 12% on day work rate. Total days 25. Total bits 18.
Casing: 8⅝-in. surface casing set at 1,600 ft. with 675 sacks of cement. 4½-in. oil string set at 11,100 ft. with 500 sacks of cement.
Mud: Water base; gel, 400 lb.; caustic, 50 lb., dispersant, 60 lb. Mud is inexpensive item, averages only about $2,000 per well.
Tops: Lower Tuscaloosa at 10,920 ft.
Core data: Lower Tuscaloosa, 99-ft. interval, 91.1 md. perm., 22.9% porosity, 40% oil sat., 60% connate-water sat. Estimated recovery: 148 bbl. per acre-ft. with water pressure maintenance.

Montana

DWYER, Sheridan County.
Pay: Mission Canyon. Total depth 8,050 ft.
Costs: Flowing well $92,000. On pump $115,000. Dry hole $57,000. Footage price $3.90. Day-work rate with pipe $1,150 and without pipe $1,050.
Rig time: 98% on footage rate. 2% on day-work rate. Total days 20. Total bits 19.
Casing: 12¼-in. surface casing set at 422 ft. with 215 sacks of cement. 5½-in. oil string set at 8,054 ft. with 110 sacks of cement.
Tops: Fort Union at Surface; Newcastle at 4,415 ft.; Dakota at 4,670 ft.; Spearfish at 6,225 ft.; Pay zone 7,959 ft.

SOAP CREEK, Big Horn County.
Pay: Tensleep and Madison. Total depth 1,875 ft.
Costs: Flowing well about $18,000. Well on pump $32,000. Dry hole $13,000. Footage price $7.00. Day-work rate with pipe $750 and without pipe $700.
Rig time: Total days 10-15. Total bits 8-15.

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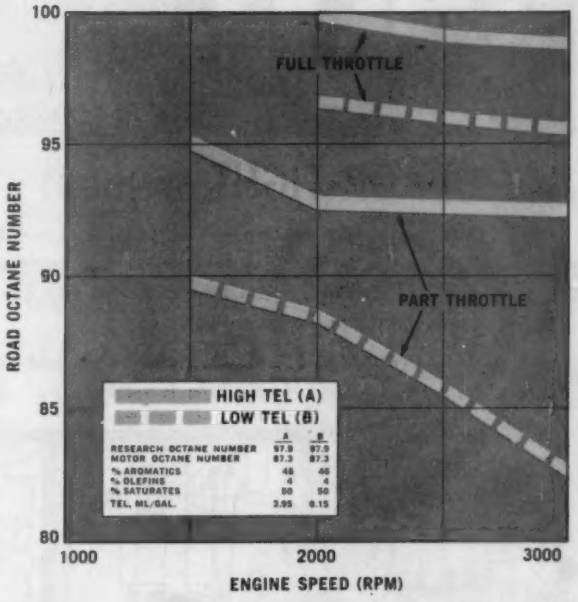
Evaluation of octane-improvement methods and costs has been a major concern with Ethyl for many years.

ROAD ANTIKNOCK RATING
FOUR-CAR AVERAGE



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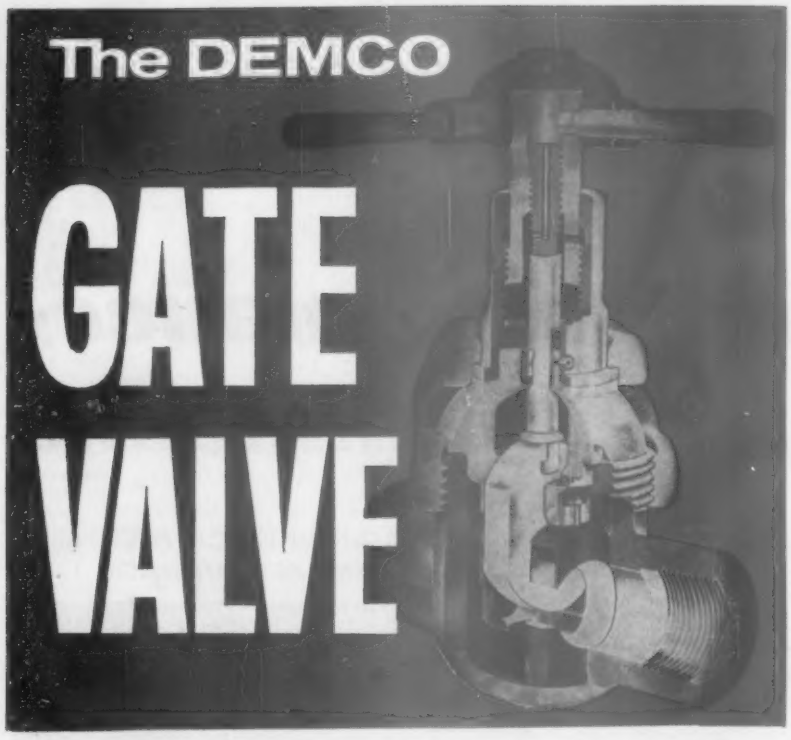

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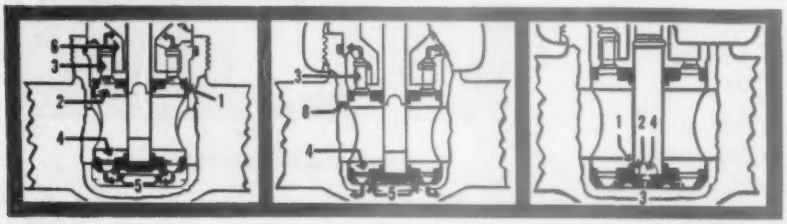
Demco's secret lies in its unique one-unit seal assembly, with its patented spread-ring construction. Here's how it works . . .



A. Resilient seat assembly (1) is reinforced with steel wear rings (2), having integral projecting pins at top (3) and bottom (4). In normal contracted position, the seat assembly is easily inserted in, removed from the body. Until the seat assembly is bottomed, the steel spread ring (5) does not act upon the lower projecting pins, nor do the bonnet lugs (6) act upon the upper pins.

B. With the bonnet down and the seat assembly bottomed, the spread ring (5) has forced the lower projecting pins (4) outward. Similarly, the upper pins (3) have been wedged outward by the descending bonnet lugs, providing a tight seal between body wall (8) and seat, preventing entrance of abrasives between seat and body wall.

C. As gate is closed, leading edge of gate slides past wear ring (1), contacts rubber ring (2) for positive rubber-to-metal seal. Seal occurs before gate touches rubber cushion (3), eliminating need for "bumping." Relief in bottom of gate (4) allows straddling of solid particles that might interfere with proper closure.

Available at supply stores everywhere in 1,000, 1,500, 2,000, 3,000 and 5,000 psi working pressures . . . in two-, three- and four-inch sizes.

DRILLING EQUIPMENT MANUFACTURING CO.

Oklahoma City, Oklahoma

Casing: 9⅝-in. surface casing set at 100-150 ft., with 75 to 125 sacks of cement. 5½-in. oil string set at total depth with 200 sacks of cement.
Mud: Cost varies $3,000 to $5,500 per hole.
Tops: Dakota at 0-100 ft.; Tensleep at 1,600-1,800 ft.; Madison at 1,800-2,000 ft.
Core data: Tensleep, gas expansion. Madison, water drive.

STENSVAD, Rosebud County.
Pay: Stensvad-Lower Tyler "B." Total depth 5,390 ft.
Costs: Well on pump $77,300. Dry hole $28,500. Footage price $4.45. Day-work rate with pipe $700 plus 1½ cents, and without pipe $700.
Rig time: 80% on footage rate. 20% on day-work rate. Total days 26. Total bits 15.
Casing: 8⅝-in. surface casting set at 110 ft. with 58 sacks of cement. 5½-in. oil string set at 5,400 ft. with 200 sacks of cement.
Mud: Bentonite, 65 sacks; quebracho, 650 lb.; caustic soda. 100 lb.; 10% oil by volume.
Tops: Dakota at 3,652 ft.; Amsden at 4,822 ft.; Lower Tyler (includes Stensvad) at 5,212 ft., Heath at 5,306 ft.
Core data: Stensvad formatiton; 5,254-84 ft. interval; 68 md. perm., 13.8% porosity; 14.6% resid. oil sat.; 42.8% total water sat. Estimated recovery: Stensvad, 135 bbl. per acre-ft.; Lower Tyler "B," 135 bbl. per acre-ft. Gas expansion.

Nebraska

ACKMAN, Redwillow County.
Pay: Topeka and Lansing-Kansas City. Total depth 3,250 ft.
Costs: Well on pump $40,000. Dry hole $18,000. Footage price $2.75. Day-work rate with pipe $700 and without pipe $650.
Rig time: 80% on footage rate. 20% day-work rate. Total days 7. Total bits 10.
Casing: 8⅝-in. surface casing set at 285 ft. with 200 sacks of cement. 4½-in. oil string set at 3,450 ft. with 125 sacks of cement.
Mud: Chemical-gel. Cost $1,000.
Tops: Oread (Topeka) at 3,200 ft.; B-Zone, Lansing-Kansas City at 3,250 ft.; C-Zone, Lansing-Kansas City at 3,300 ft.
Core data: Oread: 181 md. perm.; 18% porosity; 17% resid. oil sat.; 60% total water sat. B-Zone: 47 md. perm.; 8% porosity; 25% resid. oil sat.; 48% total water sat. C-Zone: 30 md. perm.; 15% porosity; 17% resid. oil sat.; 54% total water sat.

New Mexico

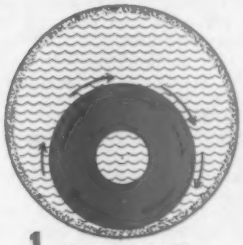
ALLISON AREA, Lea and Roosevelt counties.
Pay: Bough "C." Total depth 9,740 ft.
Cost: Flowing well $117.000. On pump $135,000. Dry hole $75,000. Footage price $5.75. Day-work rate with pipe $950 and without pipe $850.
Rig time: 90% on footage rate. 10% on day-work rate. Total days 36. Total bits 42.
Casing: 12¼-in. surface casing set at 365 ft. with 325 sacks of cement. 8⅝-in. intermediate set at 4,175 ft. with 1,265 sacks of cement. 4½-in. oil string set at 9,740 ft. with 300 sacks of cement.
Mud: Gel, 50 sacks; salt gel, 220 sacks; starch, 100 sacks; defoamer, 10 sacks; saturated brine, 520 bbl.; oil, 450 bbl.
Tops: San Andres at 4,120 ft.; Clearfork

NWS U.S. PATENT NO.-2,999,552

ENGINEERING ENTERPRISES

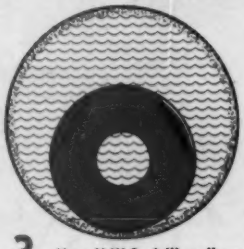
OMSCO PRITCHETT HUNT TOOL COMPANY DRILCO

THREE WAYS TO REDUCE WALL STICKING

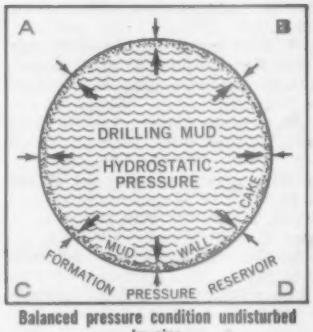


1. Keep your drilling string moving.

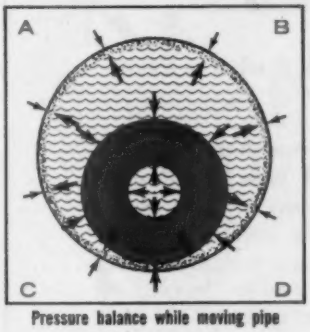
2. Keep your drill collars centered.



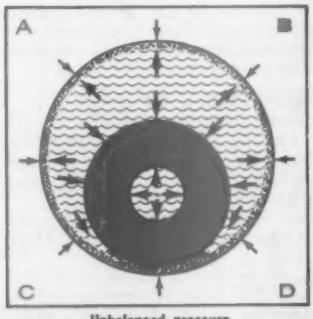
3. Use N-W-S drill collars with reduced contact area.



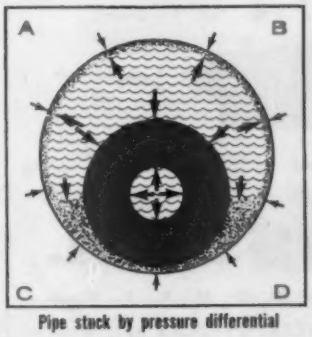
Balanced pressure condition undisturbed by pipe



Pressure balance while moving pipe



Unbalanced pressure
Pipe stopped and beginning to stick



Pipe stuck by pressure differential

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at 6,210 ft.; Hueco at 9,000 ft.; Bough "C" at 9,645 ft.
Core data: Bough "C," 9,650-75-ft. interval, 800 md. perm., 8.3% porosity, 7.4% residual-oil sat., 30% total water sat. Estimated recovery: 150 bbl. per acre-ft. Water drive.

BLANCO, San Juan County.
Pay: Mesaverde. Total depth 5,500 ft.
Costs: Flowing well $80,000. Dry hole $48,000. Footage price $5. Day-work rate with drill pipe $725, and without pipe $650.
Rig time: 85% on footage rate. 15% on day rate. Total days 18. 5otal bits 15.
Casing: 10¾-in. surface casing set at 150 ft. with 150 sacks of cement. 7⅝-in. intermediate string set at 3,000 ft. with 200 sacks of cement. 5-in. liner at 5,500 ft. with 200 sacks of cement. Note: gas drilled below 7⅝-in. pipe.
Mud: Gel and lost-circulation material. Fresh water drilling to 1.500 ft. Gas drilling below 3,000 ft.
Tops: Pictured Cliffs at 2,600 ft.; Cliff House at 4,300 ft.; Menefee at 4,380 ft.; Point Lookout at 4,900 ft.

CHA CHA, San Juan County.
Pay: Gallup. Total depth 5,500 ft.
Cost: Flowing well $57,000. Dry hole $30,000. Turnkey price to casing point $26,000. Day-work rate with pipe $900 and without pipe $800.
Rig time: 90% on turnkey. 10% on day work rate. Total days 12. Total bits 12.
Casing: 8⅝-in. surface casing set at 200 ft. with 150 sacks of cement. 4½-in. oil string set at 5,500 ft. with 200 sacks of cement.
Mud: Water, 200-3,000 ft.; gel and chemical, 250 sacks.
Tops: Gallup at 4,900-5,200 ft.
Core data: Gallup, 300 md. perm., 12-16% porosity.
Estimated recovery: 91 bbl. per acre-ft.

HORSESHOE CANYON, San Juan County.
Pay: Lower Gallup or Tacito. Total depth 1,500 ft.
Costs: Well on pump $25,000. Dry hole $17,000. Footage price $3.50. Day-work rate with drill pipe $650 and without pipe $600.
Rig time: 80% on footage rate. 20% on day-work rate. Total days 7. Total bits 2.
Casing: 8⅝-in. surface casing set at 100 ft. with 75 sacks of cement. 5½-in. oil string set at 1,500 ft. with 100 sacks of cement.
Mud: Gel chemicals to top zone; oil emulsion to pay.
Tops: Lower Gallup at 1,200 ft.; Sanostee at 1,500 ft.
Core data: Gallup-Upper pay: 30 md. perm., 16.5% porosity; 33% total water sat. Gallup-Lower pay: 90 md. perm., 17.5% porosity; 31% total water sat. Estimated recovery: 110 bbl. per acre-ft. Gas expansion.

LANGLIE-MATTIX, Lea County.
Pay: Queen. Total depth 3,650 ft.
Costs: Flowing well $39,000. On pump $50,000. Dry hole $25,000. Footage price $3.50. Day-work rate with pipe $550 and without pipe $500.
Rig time: 95% on footage rate. 5% on day-work rate. Total days 11. Total bits 14.
Casing: 8⅝-in. surface casing set at 354 ft. with 208 sacks of cement. 4½-in. oil string set at 3,369 ft. with 400 sacks of cement.
Mud: Bentonite, 40 sacks; lime, 5 sacks; salt-gel, 150 sacks; starch 10 sacks; redwood bark, 3 sacks.
Tops: Queen at 3.456 ft.

MALJAMAR, Lea County.
Pay: Grayburg-San Andres. Total depth 4,200 ft.
Costs: Flowing well $60,000. On pump $75,000. Footage price $3.75. Day-work rate with pipe $650; without pipe $600.
Rig time: 68% on footage rate; 32% on day-work rate. Total days 18. Total bits 8.
Casing: 8⅝-in. surface casing set at 235 ft. with 135 sacks of cement. 5½-in. oil string set at 4,200 ft. with 850 sacks of cement.
Mud: Salt gel, 75 sacks.
Tops: Top of salt at 900 ft.; base of salt at 1,900 ft.; Grayburg at 3,415 ft.; San Andres at 3,800 ft.
Core data: Grayburg: 3,415-3,800 ft. interval; 8 md. perm.; 9% porosity; 83% resid. oil sat.; 17% total water sat. San Andres: 3,800-4,200 ft. interval; 5 md. perm; 7% porosity; 83% resid. oil sat.; 17 total water sat. Estimated recovery: 117 bbl. per acre-ft. Gas expansion (both horizons).

VERDE-HORSESHOE CANYON, San Juan County.
Pay: Lower Gallup. Total depth 3,000 ft.
Costs: Well on pump $45,000. Dry hole $35,000. Footage price $5.50. Day-work rate with pipe $440 and without pipe $400.
Rig time: 90% on footage rate; 10% on day-work rate. Total days 20. Total bits 4.
Casing: 8⅝-in. surface casing set at 150 ft. with 100 saks of cement. 5½-in. oil string set at 3,000 ft. with 50 sacks of cement.
Mud: Spud mud. Water (gel chemical while drilling pay).
Tops: Point Lookout at 900 ft; Mancos at 1,250 ft.; Gallup at 2,300 ft.; Lower Gallup at 2,500 ft.

TOTAH AREA, San Juan County.
Pay: Gallup. Total depth 5,100 ft.
Costs: Flowing well $50,000. Turnkey to casing point $26,000. Day-work rate with pipe $900 and without pipe $800.
Rig time: 90% turnkey. 10% day-work rate. Total days 15. Total bits 12.
Casing: 8⅝-in. surface casing set at 200 ft. with 215 sacks of cement. 4½-in. oil string at 5,000 ft. with 200 sacks of cement.
Mud: Gel and lime (gel, 20 sacks, and lime. 5 sacks); gel and chemical (gel, 325 sacks, and caustic and quebrocho).
Tops: Gallup at 4,900-5,000 ft.
Core data: Gallup, 300 md. perm., 12-16% porosity.
Estimated recovery: 91 bbl. per acre-ft.

North Dakota

BLUE BUTTES, McKenzie County.
Pay: Madison. Total depth 9,400 ft.
Costs: Flowing well $136,500. On pump $156,000. Dry hole $91,000. Day-work rate with pipe $925. Drill-pipe rental is 1½ cents per foot.
Rig time: 100% on day-work rate. Total days 32. Total bits 39.
Casing: 9⅝-in. surface casing set at 620 ft. with 450 sacks of cement. 5½-in. oil string set at 9,350 ft. with 1,200 sacks of cement.
Mud: Salt gel, 74 sacks; bentonite, 40 sacks; hulls, 28 sacks; mica, 80 sacks; starch, 286 sacks; salt, 2,000 sacks; oil, 380 bbl.
Tops Greenhorn at 4,162 ft.; Skull Creek at 4,703 ft.; Dakota at 4,950 ft.; Ellis at 5,545 ft.; Spearfish at 6,307 ft.; First Permian salt at 6,621 ft.; Second Permian salt at 6,924 ft.; Amsden at 7,505 ft.; Kibbey limestone at 8,145 ft.;

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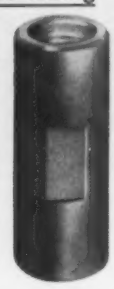

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To: Greatly Reduce Coupling Wear in Crooked Holes

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Charles at 8,288 ft.; Last salt at 8,881 ft.; Madison at 8,828 ft., pay at 9,126 ft.

CLEAR CREEK, McKenzie County.
Pay: Mississippian Mission Canyon. Total depth 9,300 ft.
Costs: Well on pump $132,000. Dry hole $78,000. Footage price $8.30.
Rig time: 100% on footage rate. Total days 36. Total bits 35.
Casing: 10¾-in. surface casing set at 600 ft. with 450 sacks of cement. 5½-in. oil string set at 9,300 ft. with 1,000 sacks of cement.
Mud: Water base.
Tops: Minnelusa at 7,100-7,300 ft.; Mississippian Mission Canyon at 9,300 ft.
Core data: Mission Canyon. 2.7 md. perm., 14.5% porosity, 27% total water sat.
Estimated recovery: 45 bbl. per acre-ft. Water drive.

CLEAR CREEK, McKenzie County.
Pay: Madison limestone. Total depth 9,400 ft.
Costs: Flowing well $101,000. On pump $117,000. Dry hole $61,000. Day-work rate with pipe $1,050 and without pipe $1,000.
Rig time: 100% on day-work rate. Total days 27. Total bits 28.
Casing: 9⅝-in surface casing set at 600 ft. with 385 sacks of cement. 5½-in oil string set at total depth with 1,000 sacks of cement.
Mud: Top hole drilled with salt water. Salt-base, oil-emulsion mud from 5,000 ft. to total depth.
Tops: Spearfish at 6,380 ft.; Heath shale at 7,708 ft.; Charles at 8,350 ft.; Madison at 9,009 ft.

GLENBURN, Renville County.
Pay: Mission Canyon. Total depth 4,515 ft.
Costs: Flowing well $47,000. On pump $57,000. Dry hole $25,000 Footage price $3.75.
Costs: Day-work rate with pipe $950, and without pipe $900.
Rig time: 75% on footage rate. 25% on day-work rate. Total days 13. Total bits 10.
Casing: 9⅝-in. surface casing set at 425 ft. with 200 sacks of cement. 5½-in. oil string set at 4,500 ft. with 125 sacks of cement.
Mud: Water base to Piper lime, gyp base from Piper lime to total depth.
Tops: Charles at 4,070 ft.; Mission Canyon at 4,390 ft.; Mission Canyon pay tankage. Footage price $4.30. Day-work at 4,500 ft.
Core data: Estimated recovery: 2,500 bbl. per acre-ft. Water drive.

RIVAL, Burke County.
Pay: Madison. Total depth 6,300 ft.
Costs: Flowing well $61,000. On pump $75,000. Dry hole $44,000, excluding rate with pipe $940 and without pipe $875.
Rig time: 85% on footage rate. 15% on day-work rate. Total days 18. Total bits 13.
Casing: 8⅝-in surface casing set at 500 ft. with 450 sacks of cement. 4½-in. oil string set at 6,300 ft. with 325 sacks of cement.
Mud: Starch, 2,800 lb.; gel, 2,700 lb.; salt gel, 2,300 lb.; gypsum, 2,000 lb.; preservative 800 lb.; cottonseed hulls, 800 lb.; lime phosphate, 500 lb. Note: Some operators use gyp-base mud converted to mud at 5,000 ft. after drilling upper section with clear water.
Tops: Dakota at 3,945 ft.; Piper lime at 4,890 ft.; Nesson main pay at 6,135 ft.; Mission Canyon at 6,200 ft.

MARTIN RUBBER & DUCK RINGS give excellent life in dirty abrasive fluids . . . high or low gravity . . . much or little water . . . shallow or deep wells. They last for years in the easier pumping wells. Replacement rings cost comparatively little.

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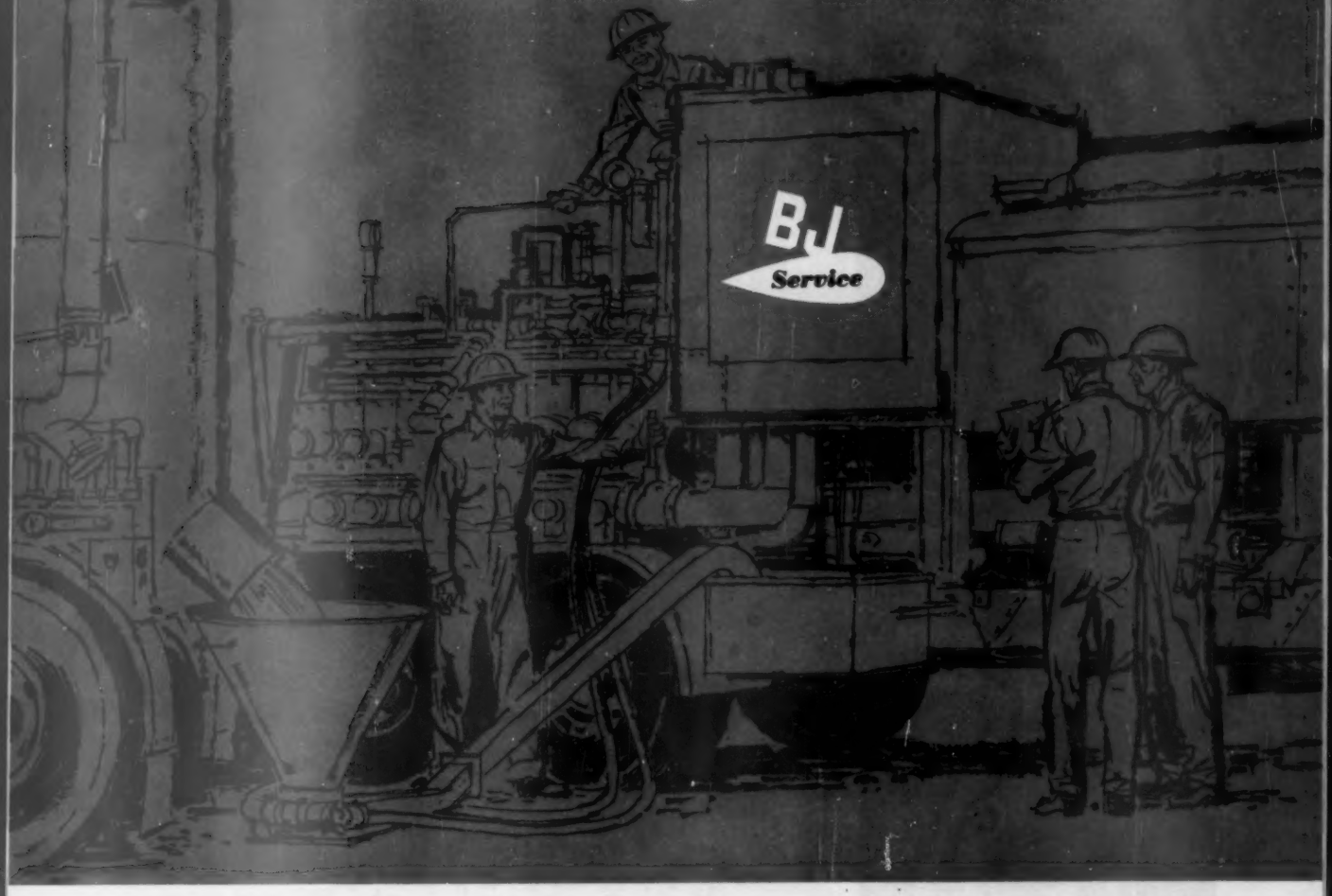

Save money on your large-volume cement jobs with HYS-400—especially designed for deep wells or those with high bottom-hole temperatures. Despite its extreme economy, this high-yield slurry has outstanding over-all properties. Density rating is only 10.8 lbs./gal. (80.6 lbs./cu. ft.), making it especially valuable in cementing through zones of possible lost circulation. Fluid loss is very low—only one-fourth that of neat cement. HYS-400 has exceptional permanency, with good bond and high corrosion resistance. High resistance to mud contamination after drill-out, too. Permeability is low . . . strength in one day is good . . . thickening time meets API standards for Class E cements. You'll be money ahead by cementing your intermediate and long casing strings with HYS-400—available *only* from BJ Service.

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Core data: Nesson main pay: 28 ft. intervals; 3 md. perm., 6.8% porosity; 10% resid. oil sat.; 41% total water sat. Estimated recovery: 40 bbl. per acre-ft. Gas expansion.

Ohio

CONNEAUT, Ashtabula County.

Pay: Medina sandstone. Total depth 3,300 ft.

Costs: Flowing gas well $30,000. Oil on pump $35,000. Dry hole $17,000. Footage price $4.

Rig time: 90% on footage rate. Cable tools.

Casing: 10¾-in. surface casing set at 200 ft. with shoe. 7-in. intermediate set at 2,300 ft. with shoe. 5½-in. oil string set at 3,300 ft. with 30 sacks.

Tops: Oriskany sandstone at 2,200 ft.; Medina sandstone at 3,200 ft.

Oklahoma

ENVILLE, Love County.

Pay: Oil Creek. Total depth 11,000 ft.

Costs: Flowing well $375,000. Dry hole $340,000. Day-work rate with pipe: 0-5,000 ft., $800; 5,000-7,500 ft., $850; 7,500-10,000 ft., $925; 10,000-12,000 ft., $950; without pipe: 0-5,000 ft., $750; 5,000-7,500 ft., $775; 7,500-10,000 ft., $800; 10,000-12,000 ft. $800.

Rig time: 100% on day-work rate. Total days 258. Total bits 151.

Casing: 20-in. surface casing set at 72 ft. with 150 sacks of cement. 13⅜-in. intermediate set at 1,024 ft. with 200 sacks of cement. 9⅝-in. oil string set at 5,556 ft. with 600 sacks of cement. 7⅝-in. oil string set at 9,655 ft. with 500 sacks of cement. 5½-in. oil string set at 10,620 ft. with 125 sacks of cement.

Mud: Gel, 190 tons; barite, 1,400 tons; soda ash, 20 tons; mica, 20 tons; woodfiber, 14 tons; flax shive, 6 tons.

Tops: Viola at 7,306 ft.; Bromide at 8,400 ft.; McLish at 9,098 ft.; Oil Creek sand at 10,444 ft. (100 ft. thick.)

Core data: Oil Creek formation: 10,600-10,700 ft. interval; 5.4 md. perm., 4.46% porosity; 5.08 resid*. oil sat. 31.47% total water sat.

Estimated recovery: 1,090 M.c.f. per acre-ft. gas expansion and 34 bbl. per acre-ft. Gas expansion.

HUGOTON, Texas County.

Pay: Chase Group. Total depth 2,650 ft.

Costs: Flowing well $25,000. Dry hole $17,000. Footage price $2.50. Hourly rate with pipe $21 and without pipe $17.

Rig time: 83% on footage rate. 17% on day-work rate. Total days 6. Total bits 5.

Casing: 8⅝-in. surface casing set at 300 ft. with 200 sacks of cement. 5½-in. oil string set at 2,650 ft. with 200 sacks of cement.

Mud: Gel, 40 sacks; salt gel, 40 sacks.

KINGFISHER AREA, Kingfisher County.

Pay: Pennsylvanian-Layton, Cleveland, Oswego, Red Fork, Inola, and Bartlesville; Mississippian-Pavin, Manning, and Meramec; Silurian and Devonian-Hunton; and Ordovician-Wilcox. Total depth 8,200 ft.

Costs: Flowing well $102,000. Dry hole $60,000. Footage price $4.75. Day-work rate with pipe $825 and without pipe $750.

Rig time: 96% on footage rate. 4% on day-work rate. Total days 35. Total bits 30-33.

Casing: 8⅝-in. surface casing set at 492 ft. with 500 sacks of cement. 4½-in. oil string set at 8,188 ft. with 300 sacks

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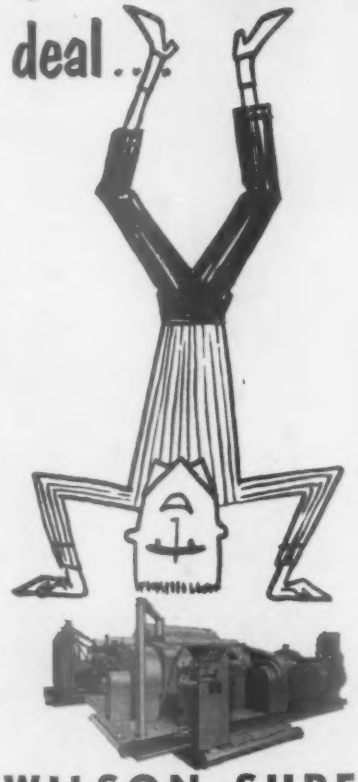

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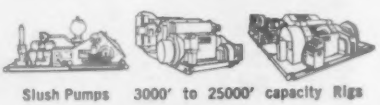

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of cement. In some areas, 5½-in. oil string is used.

Mud: Average cost of mud is $5,000. Various types are used, including: Barite, gel, lignosulfonate, lignite, soda ash, caustic soda, and some lost circulation material.

Core data: (Manning) 8,025-44 ft. interval, 36 md. perm., 11.3% porosity, 21.2% residual oil sat., 16% total water sat.

Estimated recovery bbl. per acre-ft.: Oswego 75. Manning 100. Meramec 40.

LAVERNE AREA, Harper County.

Pay: Hoover, Tonkawa, Morrow, and Chester. Total depth 7,300 to 7,600 ft.

Costs: Flowing well $95,000. Footage price $5. Day-work rate with pipe $850 and without pipe $750.

Rig time: 85% on footage rate. 15% on day-work rate. Total days 27. Total bits 22.

Casing: 13⅜-in. surface casing set at 500 ft. with 500 sacks of cement. 8⅝-in. to 9⅝-in. intermediate set at 3,000 ft. with 250 sacks of cement. 5½ to 7-in. oil string set at 7,300-7,600 ft. with 150 sacks of cement.

Mud: Gel and lost-circulation material. Cost averages $2,500 to $4,000.

Tops: Hoover at 4,100 ft.; Tonkawa at 5,400 ft.; Morrow at 6,900 ft.; Chester at 7,100 ft.

MOCANE, Beaver County.

Pay: Council Grove, Tonkawa, Morrow, and Chester. Total depth 7,500 ft.

Costs: Flowing well $110,000. Dry hole $70,000. Footage price $4.25. Day-work rate with pipe $750, and without pipe $700.

Rig time: 94% on footage rate. 6% on day-work rate. Total days 33. Total bits 28.

Casing: 13⅜-in. surface casing set at 550 ft. with 400 sacks of cement. 9⅝-in. intermediate set at 2,800 ft. with 500 sacks of cement. 5½-in. oil string set at 7,500 ft. with 500 sacks of cement.

Mud: Gel, 90,000 lb.; lignite, 5,000 lb.; soda ash, 5,000 lb.; caustic soda, 4,000 lb.; lost-circulation material, 40,000 lb.

Tops: Council Grove at 3,400 ft.; Tonkawa at 5,500 ft.; Checkerboard at 6,000 ft.; Morrow at 7,000 ft.; Chester at 7,400 ft.

Core data: Council Grove formation: 20 md. perm., 8.25% porosity; 50% total water sat.; Tonkawa formation: 14 md. perm., 15.50% porosity; 29% total water sat.; Morrow formation: 5 md. perm., 12% porosity; 30.5% total water sat.; Chester formation: 9 md. perm., 8% porosity; 25% total water sat.

Estimated recovery M.c.f. per acre-ft.: Council Grove 100; Tonkawa 600; Morrow 475; Chester 375.

MOORE AREA, Cleveland County.

Pay: Red Fork, Bartlesville. Total depth 8,090 ft.

Costs: Flowing well $109,000. On pump $123,000. Dry hole $53,000. Footage price $4.50. Day-work rate with pipe $650 and without pipe $600.

Rig time: 81% on footage rate. 19% on day-work rate. Total days 46. Total bits 36.

Casing: 10¾-in. surface casing set at 824 ft. with 650 sacks of cement. 5½-in oil string set at 8,089 ft. with 250 sacks of cement.

Mud: Water-base 5% oil, 807 sacks. Approximate cost $2,475.

Tops: Red Fork at 7,542-53.; Bartlesville 7,672-7,706 ft.

Core data: Estimated recovery: Red Fork 360 bbl. per acre-ft.; Bartlesville 400 bbl. per acre-ft.

MOORE AREA, Cleveland County.

Pay: Second Wilcox and Tulip Creek. Total depth 8,020 ft.

Costs: Flowing well (dual completion) $117,000. Pump (dual) $147,000. Dry hole $61,700. Footage price $5. Day-work rate with pipe $750 and without pipe $700.

Rig time: 67% on footage rate. 33% on day-work rate. Total days 76. Total bits 36.

Casing: 10¾-in. surface casing set at 815 ft. with 650 sacks of cement; 7-in. oil string set at 8,020 ft. with 250 sacks of cement.

Mud: Gel, 46 sacks; soda ash, 50 sacks; caustic, 30 sacks.

Tops: Second Wilcox at 7,250 ft.; Tulip Creek at 7,525 ft.; Oil Creek at 7,930 ft.

Core data: Second Wilcox formation: 100 ft. interval; 50 md. perm., 8-10% porosity; 8-12% resid. oil sat.; 25-35% total water sat. Tulip Creek: 10 ft. interval; 25-50 md. perm.; 15% porosity; 8-10% resid. oil sat.; 35-40% total water sat. Oil Creek: 15 ft. interval; 35 md. perm.; 12% porosity; 10-12% resid. oil sat.; 35-40% total water sat.

NOBLE AREA, Cleveland County.

Pay: Bromide, Tulip Creek, McLish, and Oil Creek. Total depth 8,995 ft.

Costs: Flowing well (dual completion) $140,000. On pump (dual completion) $170,000. Dry hole $75,000. Footage price $4. Day-work rate $750 plus 1½ cents per foot per day for pipe.

Rig time: 50% on footage rate. 50% on day-work rate. Total days 50. Total bits 46.

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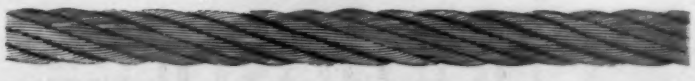

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Casing: 10¾-in. surface casing set at 859 ft. with 725 sacks of cement. 7-in. oil string set at 8,805 ft. with 525 sacks of cement.
Mud: Barite, 140 sacks; gel, 163 sacks; salt gel, 254 sacks.
Tops: Bromide at 7,950 ft.; Tulip Creek at 8,215 ft.; McLish at 8,350 ft. Oil Creek at 8,650 ft.
Core data: Bromide formation: 25 ft. interval; 200 md. perm., 10-12% porosity; 8-10% resid. oil sat.; 35% total water sat. Tulip Creek formation: 20 ft. interval; 300 md. perm., 15-18% porosity; 10% resid. oil sat.; 45% total water sat. Oil Creek formation: 30 ft. interval; 100 md. perm.; 12-15% porosity; 10-12% resid. oil sat.; 40% total water sat.

NORMAN, Cleveland County.
Pay: Bromide, Tulip Creek, McLish, and Oil Creek. Total depth 8,950 ft.
Costs: Flowing well $160,000. On pump $175,000. Dry hole $81,000. Footage price $4.00. Day-work rate with pipe $700 plus 1½ cents per ft.
Rig time: 90% on footage rate. 10% on day-work rate. Total days 54. Total bits 36.
Casing: 10¾-in. surface casing set at 865 ft. with 800 sacks of cement. 7-in. oil string set at 8,950 ft. with 750 sacks of cement.
Mud: Native to approximately 7,500 ft. Oil emulsion to total depth. Average mud cost $4,500.
Tops: Bromide at 8,020 ft.; Tulip Creek at 8,310 ft.; McLish at 8,445 ft.; Oil Creek at 8,760 ft.
Core data: Bromide, 8,028-36 ft. interval, 0.1 to 296 md. perm., 10 to 18% porosity, trace to 10% residual oil sat., 30 to 67% total water sat. Tulip Creek, 8,300-71 ft. interval, 0.1 to 228 md. perm., 5 to 25% porosity, 0 to 15% residual oil sat., 14 to 67% total water sat. McLish, 8,453-58 ft. interval, 1.4 md. perm., 10 to 12% porosity, 7 to 10% residual-oil sat., 23 to 36% total water sat. Oil Creek, 8,750-70 ft. interval, 0.1 to 104 md. perm., 3 to 16% porosity, 0 to 15% residual-oil sat., 17 to 47% total water sat.
Estimated recovery bbl. per acre-ft.: Bromide 500, Tulip Creek 400, upper McLish 115, middle McLish 500, basal McLish 250, Oil Creek 500. Water drive.

NORTHEAST CHEYENNE VALLEY, Major County.
Pay: Cherokee. Total depth 7,250 ft.
Costs: Flowing well $72,000. On pump $82,000. Dry hole $45,000. Footage price $4.40. Day-work rate with pipe $775 and without pipe $725.
Rig time: 87% on footage rate. 13% on day-work rate. Total days 31.
Casing: 9⅝-in. surface casing set at 500 ft. with 250 sacks of cement. 4½-in. oil string set at 7,200 ft. with 180 sacks of cement.
Mud: Bentonite, 4,380 sacks; salt gel, 9,700 sacks; starch, 6,200 lb.; preservative, 600 lb.; cottonseed hulls, 7,600 lb.; fiber, 4,600 lb.
Tops: Cherokee at 7,200 ft.
Core data: Cherokee formation: 35 ft. interval; 5 md. perm., 15% porosity; 13% resid. oil sat.; 35% total water sat.
Estimated recovery: 100 bbl. per acre-ft. Gas expansion.

NORTHEAST GIBBON SPUR, McClain County.
Pay: Marshall, Second Wilcox, and Oil Creek sands. Total depth 8,600 ft.
Costs: Flowing well $165,000. Dry hole $77,000. Footage price $5.50. Day-work rate with pipe $800 and without pipe $700.
Rig time: 80% footage rate. 20% day-work rate. Total days 45. Total bits 44.
Casing: 13⅜-in. surface casing set at 100 ft. with 200 sacks of cement. 9⅝-in. intermediate set at 1,000 ft. with 350 sacks of cement. 7-in. oil string set at 8,600 ft. with 350 sacks of cement. Majority of wells dual or triple completions.
Mud: Water to 6,000 ft. Oil emulsion to total depth. Weight material, 75 sacks; gel, 1,800 sacks; caustic, 2 tons; soda ash, 2 tons; thinner, 5 tons; diesel oil, 333 bbl.
Tops: Marshall at 7,720 ft.; Second Wilcox at 7,740 ft.; Oil Creek at 8,545 ft.
Core data: Marshall, 10.0 ft. of cored intervals, 74.3 md. perm., 8.5% porosity, 7.4% residual-oil sat., 25.1% total water sat. Second Wilcox, 67.5 ft. of cored intervals, 199.1 md. perm., 11.7% porosity, 6.5% residual-oil sat., 34.6% total water sat. Oil Creek, 43 ft. of cored intervals, 148.7 md. perm., 16.5% porosity, 12.7% residual-oil sat., 26.1% total water sat.
Estimated recovery bbl. per acre-ft.: Marshall 149, second Wilcox 195, Oil Creek 388. Water drive.

NORTH OKARCHE, Kingfisher County.
Pay: Manning. Total depth 8,200 ft.
Costs: Flowing well $112,000. Dry hole $63,000. Footage price $5. Day-work rate with pipe $800 and without pipe $725.
Rig time: 90% footage rate. 10% day-work rate. Total days 36. Total bits 33.
Casing: 10¾-in. surface casing set at 650 ft. with 550 sacks of cement. 5½-in. oil string set at 8,200 ft. with 300 sacks of cement.
Mud: Barite, 75 tons; gel, 75 tons; lignosulfonate, 9,800 lb.; lignite, 10,000 lb.; soda ash, 4,800 lb.; caustic soda, 3,500 lb.; lost circulation material, 180 sacks.
Tops: Layton at 6,750 ft.; Oswego at 7,550 ft.; Manning at 8,130 ft.
Core data: Manning formation: 8,180-90 ft. interval; 11.6 md. perm., 9.4% porosity; 15% total water sat., gas production.

NORTHWEST OKEENE, Blaine County.
Pay: Chester. Total depth 7,400 ft.
Costs: Flowing well $100,000. Dry hole $70,000. Footage price $4.75. Day-work rate with pipe $900 and without pipe $800.
Rig time: 75% on footage rate. 25% on day-work rate. Total days 28. Total bits 29.
Casing: 8⅝-in. surface casing set at 800 ft. with 400 sacks of cement. 5½-in. oil string at 7,300 ft. with 250 sacks of cement. 4-in. FJ liner of 200 ft. with 50 sacks of cement.
Mud: Native as far as possible, then salt-gel starch mud. $3,000 for oil and mud materials.
Tops: Red Fork at 7,200 ft.; Inola at 7,300 ft.; Chester at 7,350 ft.

WAYNE AREA, McClain County.
Pay: Bromide-Hunton-Hart. Total depth 10,900 ft.
Costs: Flowing well $230,000. Dry hole $100,000. Footage price $6.50. Day-work rate with pipe $950, and without pipe $900.
Rig time: 60% on footage rate. 40% on day-work rate. Total days 90.
Casing: 10¾-in. surface casing set at 800 ft. with 500 sacks of cement. 7-in. oil

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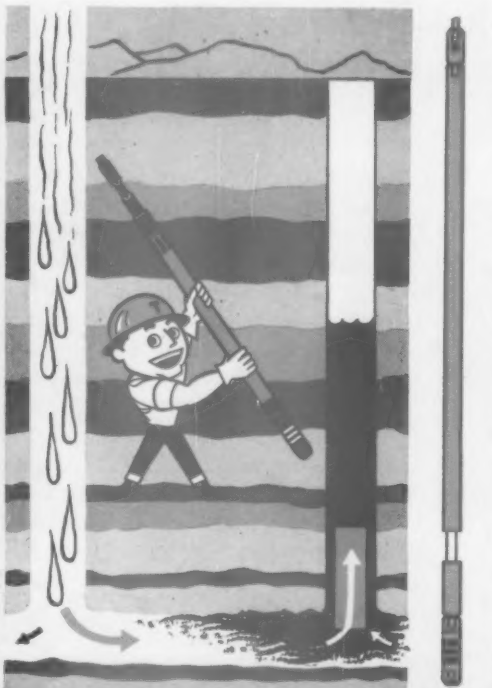
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string set at 10,000 ft. with 500 sacks of cement.
Mud: Gel, 9.8-lb. Average cost $12,500.
Tops: Hart at 8,500 ft.; Hunton at 9,200 ft.; Bromide 10,000 ft.
Core data: Hart: 1-50 md. perm., 15% porosity. Hunton: 1-20 md. perm., 10% porosity; Bromide: 1-100 md. perm., 17% porosity.
Estimated recovery (bbl. per acre-ft.): Hart 125; Hunton 75; Bromide 100. Gas expansion.

SHATTUCK AREA, Ellis County.
Pay: Morrow. Total depth 10,000 ft.
Costs: Flowing well $160,000. Dry hole $90,000. Footage price $5. Day-work rate with pipe $950 and without pipe $850.
Rig time: 50% on footage rate. 50% on day-work rate. Total days 49. Total bits 39.
Casing: 20-in. surface casing conductor set at approximately 40 ft. with 4 yd. 8⅝-in. or 9⅝-in. intermediate set at 3,700 ft. with 200 sacks of cement at bottom; 300 sacks at stage tool. 4½ or 5½-in. oil string set at 10,000 ft. with 150-200 sacks of cement.
Mud: O-Intermediate casing point, natural. Intermediate casing point—TD, gel chemical with oil and lost-circulation material added as required. Average cost of mud and oil, 90 cents per foot.
Tops: Morrow at 9,300 ft.; Mississippian at 10,000.

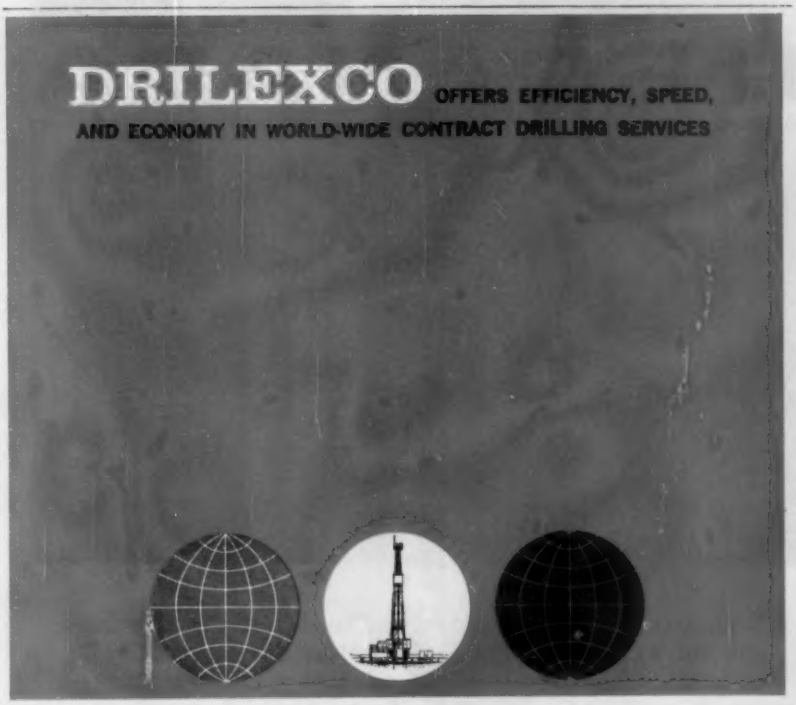
SHO-VEL-TUM, Stephens County.
Pay: Oil Creek-McLish. Total depth 8,100 ft.
Costs: Flowing well $125,000. On pump $131,000. Dry hole $75,000. Footage price $5. Day-work rate with pipe $700; without pipe $600.
Rig time: 90% on footage rate. 10% on day-work rate. Total days 70. Total bits 50.
Casing: 10¾-in. surface casing set at 314 ft. with 275 sacks of cement. 7-in. oil string set at 6,258 ft. with 250 sacks of cement. 5½-in. set at 6,190 ft. with 300 sacks of cement. Liner to 7,999 ft.
Mud: Gel, 60,000 lb.; lignite, 5,000 lb.; barite, 5,000 lb.
Tops: Fusilina at 3,389 ft.; Tussy at 3,712 ft.; Woodford at 4,226 ft.; Sylvan at 5,020 ft.; McLish at 7,600 ft.; Oil Creek at 7,800 ft.

SOUTHEAST MARIETTA, Love County.
Pay: Oil Creek. Total depth 14,600 ft.
Costs. Flowing well $504,000. Dry hole $400,000. Footage price $14.50. Day-work rate with pipe $1,450, and without pipe $1,200.
Rig time: 90% on footage rate. 10% on day-work rate. Total days 145. Total bits 121.
Casing: 13⅜-in. surface casing set at 1,300 ft. with 800 sacks of cement. 9⅝-in. intermediate set at 11,000 ft. with 600 sacks of cement. 5½-in. oil string set at 14,000 ft. with 500 sacks of cement.
Mud: Gel, 3,350 sacks; barite, 5,500 sacks; lignite, 1,150 sacks; oil, 700 bbl.
Tops: Deese at 4,800 ft.; Viola at 10,800 ft.; Bromide at 11,900 ft.; Oil Creek at 14,000 ft.

VALLEY CENTER, Dewey County.
Pay: Tonkawa and Oswego. Total depth 9,700 ft.
Costs: Flowing well $190,000. On pump $215,000. Dry hole $115,000. Footage price $5.50. Day-work rate with pipe $900 and without pipe $800.
Rig time: 90% on footage rate. 10% on day-work rate. Total days 48. Total bits 45.
Casing: 13⅜-in. surface casing set at 520 ft. with 500 sacks of cement. 9⅝-in. intermediate set at 3,900 ft. with 600 sacks of cement. 5½-in. oil string set at 9,700 ft. with 500 sacks of cement.
Mud: Gel, 70 tons; cottonseed hulls, 19 tons; soda ash, 2 tons; fiber, 2 tons; caustic soda, 3 tons.
Tops: Tonkawa at 7,500 ft., and Oswego at 9,200 ft.
Estimated recovery bbl. per acre-ft. (gas expansion): Tonkawa 1,042 M.c.f.; Oswego 1,371 M.c.f.

East Texas

BETHANY-LONGWOOD AREA, Panola and Harrison counties.
Pay: Fredericksburg lime. Total depth 2,450 ft.
Costs: Well on pump or gas-lift $17,000. Dry hole with production casing $12,000. Footage price $1.45. Day-work rate with pipe $350 and without pipe $300.
Rig Time: 75% on footage rate. 25% day-work rate. Total days 4. Total bits 1.
Casing: 8⅝-in. surface casing set at 220 ft. with 100 sacks of cement. 4½-in. oil string set at 2,450 ft. with 175 sacks of cement. 2⅜-in. tubing to 2,450 ft. for gas lift.
Mud: Natural.
Tops: Top Nacatoch at 1,050 ft.; Base Pecan Gap at 1,800 ft.; Base Austin chalk at 2,395 ft.; Top Fredericksburg lime at 2,400 ft.
Core data: Fredericksburg lime, 15 ft. interval, 8 md. perm. 25% porosity, 16% residual-oil sat., 55% total water sat.



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Estimated recovery: 120 bbl. per acre-ft. Gas expansion.

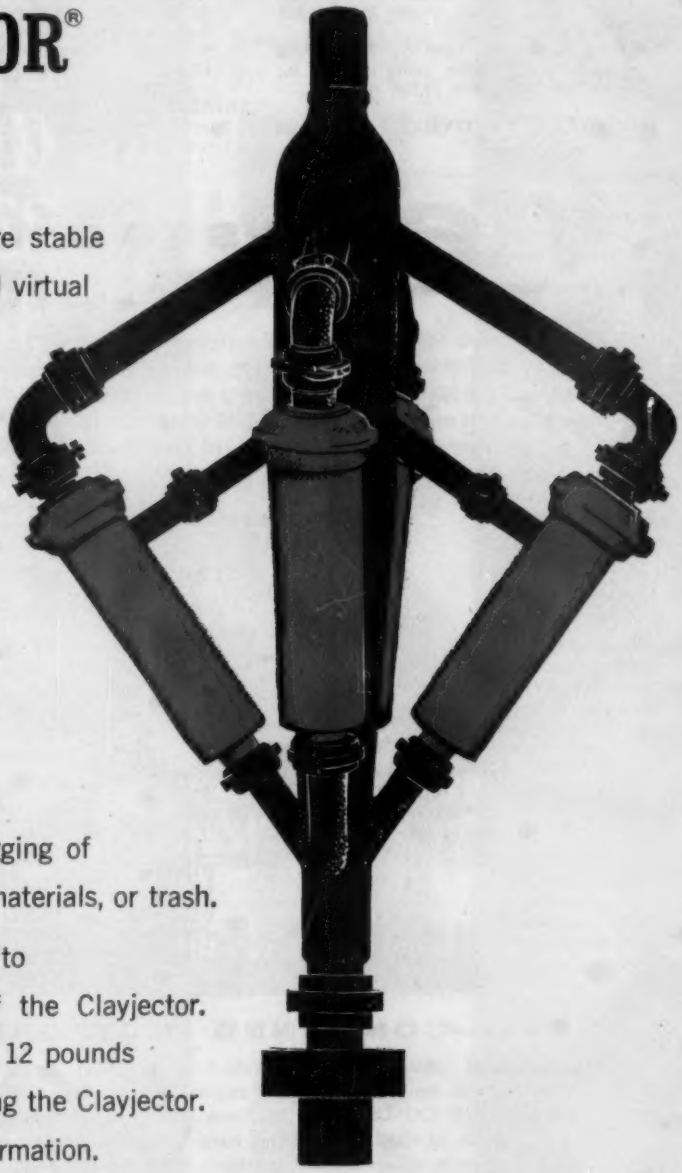
BETHANY (NORTHEAST), Panola County.
Pay: Jenkins, Woolworth (3,720-ft. sand), and Mooringsport (3,850-ft. lime). Total depth 3,900 ft.
Costs: Flowing well $55,000. On pump $62,000. Dry hole $30,000. Footage price $2.30. Day-work rate with pipe $625 and without pipe $575.
Rig time: 51% on footage rate. 49% day-work rate. Total days 17. Total bits 4.
Casing: 9⅝-in. surface casing set at 325 ft. with 210 sacks of cement. 7-in. oil string set at 3,900 ft. with 300 sacks of cement. 2⅜-in. tubing set at 3,800 ft.
Mud: Bentonite, 190 sacks; quebracho, 20 sacks; mica, 135 sacks; cellophane, 38 sacks; caustic soda, 1,800 lb.; gel, 10 sacks.
Tops: Top Glen Rose at 2,905 ft.; Jenkins at 3,650 ft.; Woolworth (3,720 ft. sand), at 3,685 ft.; Mooringsport (3,850 ft. lime) at 3,780 ft.
Core data: Jenkins, 4 ft. interval, 190 md. perm., 22.5% porosity, 16.5% residual oil sat., 42% total water sat. Woolworth, 5 ft. interval, 70 md. perm., 20% porosity, 16.5% residual oil sat., 38.5% total water sat. Mooringsport, 12 ft. interval, 18.5 md. perm., 17.5% porosity, 14% residual-oil sat., 36.5% total water sat.
Estimated recovery in bbl. per acre-ft.: Jenkins, 167; Woolworth, 125; Mooringsport, 105. Gas expansion.

BRYANS MILL, Cass County.
Pay: Smackover. Total depth 10,500 ft.
Costs: Flowing well $200,000. Dry hole $135,000. Footage price $8.75. Day-work rate with pipe $1,100 and without pipe $1,000.
Rig time: 73% on footage rate. 27% on day-work rate. Total days 67. Total bits 55.
Casing: 9⅝-in. surface casing set at 2,000 ft. with 600 sacks of cement. 5½-in. oil string set at 10,500 ft. with 600 sacks of cement.
Mud: Caustic, 8,500 lb.; lignosulfonate, 12,000 lb.; bentonite, 200 sacks; clay, 50 sacks; barite, 500 sacks; emulsifier, 400 gal.; detergent, 55 gal.; diesel oil, 300 bbl.; CMC, 2,000 lb.
Subsea tops: Base Austin chalk at 3,200 ft.; Paluxy at 4,150 ft.; Massive anhydrite at 5,650 ft.; Pettit at 6,500 ft.; Travis Peak at 6,600 ft.; Cotton Valley at 7,800 ft.; Buckner at 9,400 ft.; Smackover at 10,000 ft.

FAIRWAY AREA, Anderson and Henderson counties.
Pay: Lower Cretaceous-James lime reef. Total depth 10,200 ft.
Costs: Flowing well $125,000. Dry hole $85,000. Footage price $5. Day-work rate with pipe $900.
Rig time: Total days 35 to 40. Total bits 25.
Casing: 13⅜-in. or 8⅝-in. surface casing set at 2,000 ft. or 50 ft. into Midway shale, cemented to surface. Oil string is 7-in., 5½-in. or 4½-in. set to total depth.
Mud: Mostly gel.
Tops: Austin chalk at 4,513 ft.; Woodbine at 4,996 ft.; Georgetown at 6,256 ft.; Paluxy at 7,350 ft.; Mooringsport at 8,820 ft.; Rodessa at 9,470 ft.; top of James lime at 9,868 ft.
Core data: Only figure available, porosity averages 12%.
Estimated recovery: 70 bbl. per acre-ft. Both solution-gas and water drives.

NEW HOPE, Franklin County.

NEW...
THE SWACO
GOLDEN CLONE
CLAYJECTOR®



Three major improvements result in more stable operation, greater ease of adjustment and virtual elimination of plugging.

New Golden Clone* cyclones feature a ceramic lining so wear-resistant that clone dimensions so essential to efficient operation remain unchanged even after months of use.

New pressure regulator for feed holds uniform correct pressure on cyclones. Single valve adjustment of dilution simplifies operation.

New SWACO Auto-Screen* prevents plugging of unit with drilled solids lost circulation materials, or trash.

These improvements have added greatly to the already outstanding performance of the Clayjector. If you are drilling with mud heavier than 12 pounds per gallon, you can cut mud costs by using the Clayjector. Ask a SWACO representative for full information.

*TM

SWACO

717 FT. WORTH NATIONAL BANK BLDG., FORT WORTH 2, TEXAS • Telephone: EDison 2-4433 • Cable Address: "SWACO" Fort Worth

LOUISIANA: New Orleans, Lafayette • TEXAS: Houston, Corpus Christi, Fort Worth, Kermit • OKLAHOMA: Oklahoma City • NEW MEXICO: Farmington

Pay: Smackover lime. Total depth 12,400 ft.
Costs: Flowing well $380,000. Footage price $11. Day-work rate with pipe $1,050 and without pipe $900.
Rig time: 90% on footage rate, 10% on day-work rate. Total days 90. Total bits 90.
Casing: 13⅜-in. surface casing set at 900 ft. with 650 sacks of cement. 9⅝-in. intermediate set at 8,400 ft. with 1,100 sacks of cement. 7-in. oil string set at 12,400 ft. with 500 sacks of cement.
Mud: gypsum, 35 sacks; lignosulfonate, 765 sacks; caustic, 15,500 lb.; gel, 801 sacks; oil, 550 bbl.
Tops: Rodessa at 7,300 ft.; Travis Peak at 8,000 ft.; Cotton Valley at 9,300 ft.; Buckner Anhydrite 11,500 ft.

SOUTHEAST FRUITVILLE, Van Zandt County.
Pay: Cotton Valley, James, and Rodessa. Total depth 13,000 ft.
Costs: Flowing $320,000. Dry hole $250,000. Footage price $12. Day-work rate with pipe $1,150 and without pipe $950.
Rig time: 85% footage rate. 15% day-work rate. Total days 160. Total bits 140.
Casing: 13⅜-in. surface casing set at 120 ft. 9⅝-in. intermediate set at 5,228 ft.; 7-in. oil string set at 12,096 ft.
Mud: Native mud; native mud and bentonite; 5,300-7,000 ft. gel. chemical mud; 7,000-ft. TD, or top salt-gyp. base.
Tops: Massive anhydrite at 7,700 ft.; Rodessa at 8,100 ft.; Travis Peak at 8,700 ft.; Cotton Valley at 9,900 ft.; Salt 12,000.

TRIZ-LIZ AREA, Titus County.
Pay: Woodbine. Total depth 3,900 ft.
Costs: Flowing well $27,000. On pump $39,000 (single), $62,000 (dual). Dry hole $13,900. Footage price $2.25. Day-work rate with pipe $600 and without pipe $550.
Rig time: 80% on footage rate. 20% day-work rate. Total days 10. Total bits 5.
Casing: 9⅝-in. surface casing set at 190 ft. with 80 sacks of cement. Single: 4½-in. oil string set at 3,700 ft. with 300 sacks of cement. Dual: 5½-in. oil string set at 3,700 ft. with 300 sacks of cement.
Mud: Bentonite, 2,000 lb.; quebracho, 10 sacks; caustic soda, 5 sacks; lime, 5 sacks; CMC, 5 sacks.
Tops: Woodbine "A-1" at 3,565 ft.; Woodbine "B" at 3,635 ft.
Core data: Woodbine "A-1," 3,566-ft. interval, 12 md. perm., 31% porosity, 10% residual-oil sat., 73.5% total water sat. Woodbine "B," 3,635-52 ft. interval, 203 md. perm., 33% porosity, 14.6% residual-oil sat., 67.8% total water sat. Woodbine "B" 3,615-34 ft. interval, 85 md. perm., 28.8% porosity, 12.6% residual-oil sat., 68% total water sat.
Estimated recovery bbl. per acre-ft. 236 and 206 with gas expansion; 900 and 828 with water drive.

WRIGHT MOUNTAIN, Smith County.
Pay: Pettet. Total depth 8,500 ft.
Costs: Flowing well $85,000. Dry hole $59,000. Footage price $3.90. Day-work rate with pipe $650 and without pipe $550.
Rig time: 80% on footage rate. 20% on day-work rate. Total days 50. Total bits 27.
Casing: 8⅝-in. surface casing set at 1,440 ft. with 375 sacks of cement. 5½-in. oil string set at 8,435 ft. with 350 sacks of cement.
Mud: Depth 4,000-7,000, weight 9-8 to 10; viscosity 34-36 cc.; water loss 10-15 cc. Depth 7,000-8,500, weight 10 to 10.3; viscosity 38-42 cc.; water loss 8-12 cc.
Tops: Glen Rose at 5,930 ft.; Massive Anhydrite at 7,286 ft.; Pettet 8,194 ft.; Travis Peak at 8,416 ft.
Core data: Pettet formation: 6 ft. interval; 4.1 md. perm., 12.8% porosity; 14.3% resid. oil sat.; 12.4% total water sat.
Estimated recovery: bbl. per acre-ft. (gas expansion): Pettet 117.

North Texas

BOONESVILLE, Wise County.
Pay: Bend conglomerate. Total depth 6,200 ft.
Costs: Flowing well $65,000. Footage price $4.25. Day-work rate with pipe $750 and without pipe $700.
Rig time: 90% on footage rate. 10% on day-work rate. Total days 25. Total bits 25.
Casing: 8⅝-in. surface casing set at 400 ft. with 250 sacks of cement. 4½ and 5½-in. oil string set at 6,200 ft. with 200 to 400 sacks of cement.
Mud: Gel, 800 sacks; oil, 300 bbl.
Tops: Caddo at 4,000 ft.; Bend at 6,000 ft., gas production.

CONLEY, Hardeman County.
Pay: Palo Pinto, Mississippi, Osage, and Ellenburger. Total depth 8,250 ft.
Costs: Ellenburger well: Flowing well $80,000. On pump $100,000. Dry hole $50,000. Dual completion: Flowing $130,000; on pump $155,000.
Rig time: 95% on footage rate. 5% on day-work rate. Total days 33. Total bits 28.
Casing: 9⅝-in. surface casing set at 300 ft. with 125 sacks of cement. 7-in. oil

1 OF 6 WAYS TO DRILL OFFSHORE

Each is available to the OFFSHORE customer, in addition to a quarter-century of drilling experience, a top engineering and operations staff, and a proved record of *success* in this demanding field—where mistakes cost money *fast.* Consult THE OFFSHORE COMPANY for the most economical, efficient type of unit and combination of services for your drilling situation.

SELF-CONTAINED PLATFORM

The oldest offshore drilling method is still best for some development drilling and special exploratory situations. THE OFFSHORE COMPANY'S platform rigs have unitized design, can be handled by a derrick barge in just 6 lifts, require minimum size self-contained platform, and are the result of OFFSHORE'S years of experience in developing the *right tool* for *each job.*

OWNERS AND OPERATORS OF THE LARGEST FLEET OF DEEP-WATER MOBILE DRILLING UNITS IN THE WORLD

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NOWSCO OIL-FIELD MEN OBSOLETE 7 STANDARD WELL PRACTICES ...WITH SPACE-AGE LIQUID NITROGEN TECHNIQUES

NOWSCO men cut your drilling, completion and producing costs with an idea borrowed from missile practice. They pump Liquid Nitrogen to as high as 10,000 psi, then gasify it for servicing wells in many ways. 1700 money, time and trouble saving jobs in the 1½ years since NOWSCO first tested the Liquid Nitrogen idea have well proven the worth of these techniques.

In addition, Nitrogen is eminently practical for purging gathering lines and storage tanks against corrosion or fire hazard. Other profitable uses appear every week. Want the NOWSCO story on your own field conditions? Write today or call our Houston office: UN 4-0965.

NOWSCO offers the only complete Liquid Nitrogen service . . . from manufacture through field application.

NOWSCO service trucks and trained operators who are oil-field veterans are on 24-hour call at stations in Houston, Corpus Christi, Perryton, Orange, Odessa and Lafayette, La.

Originator and prime authority on liquid nitrogen techniques . . .

NOWSCO N_2

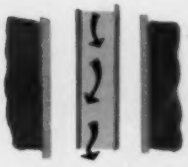
NITROGEN OIL WELL SERVICE COMPANY

3602 West 11th Street, Houston, Texas. Tel: UN 4-0965

Here are 7 standard practices obsoleted by NOWSCO techniques:

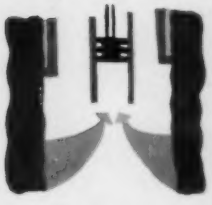
Pressure testing with fluid

Pressure testing for leaks in surface equipment is far more sensitively done with Nitrogen than fluid. Gas will detect leaks where high-pressure fluid will not.



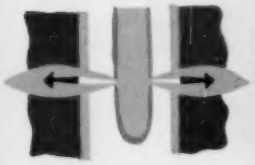
Corrosion inhibitor slugged down tubing

Top-to-bottom "misting" of tubing by nitrified corrosion inhibitor contacts the surface for hours, not minutes. No swabbing-out of fluids. Inhibitor easily squeezed into formation when desired.



Swabbing-in and drill stem testing

Drilling and well fluids displaced by Nitrogen which is then bled off under control to bring in well. Faster, safer than swabbing . . . ends blowouts, swab loss, cable-scarring of plastic tubing lining.



Hydraulic perforating

Co-mingling with Nitrogen increases penetration up to 400%. Especially useful in salt water disposal systems, to increase injectability.

Swabbing-out spent frac fluids and acids

Spent frac fluids and acids pushed out of formation with Nitrogen bubbles.

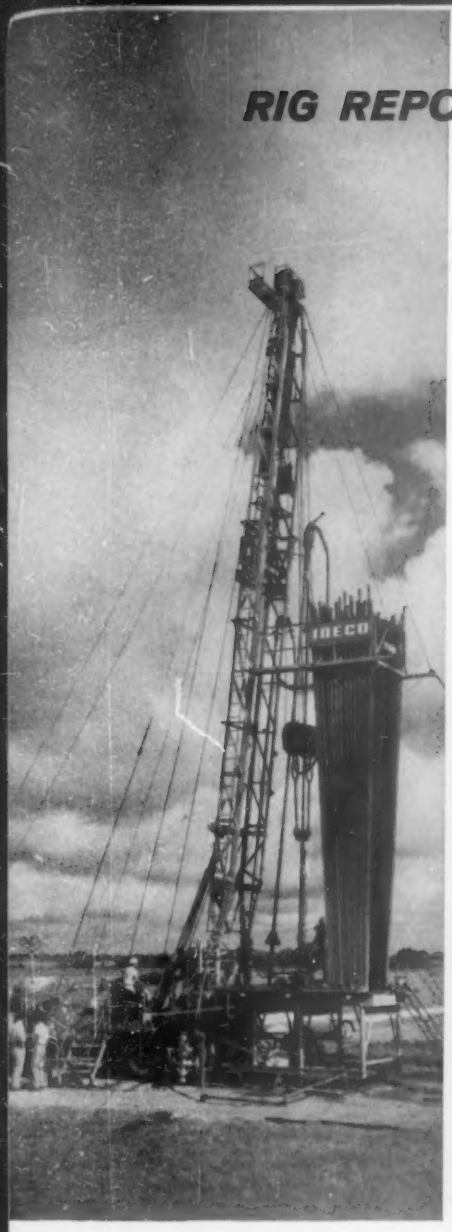
Slow chemical lightening of mud density to combat lost circulation

One-trip reduction of mud density with Nitrogen bubbles.

Switching from air to mud when drilling near gas

Add Nitrogen to air, preventing down-hole explosions. All-Nitrogen drilling is often practical.

RIG REPORT



FOR SERVICING AND WORKOVER

. . . In the fields of South Texas, this Ideco Drive-In Rambler is equipped with an Ideco DUAL SPEED SYSTEM which saves 30 to 50 percent of the time usually required to pull or run tubing. On this location 185 stands were run in the hole in 45 minutes. Drive-In Ramblers equipped with the Dual Speed System are the answer to faster, more efficient, and more economical well servicing and workover operations. The Dual Speed System can be installed on most types of Ideco servicing and workover rigs.

FOR COMPLETION

. . . On a deep well in the scenic foothills of the Canadian Rockies. This Ideco DIR-604 Drive-in Rambler Rig is the largest self-propelled rig ever put on location in Canada. Nearly 400 horsepower propels this highly mobile rig to the job. The same engine powers the H-40 Hydrair Hoist on the job. The 95-ft. Kwik-Lift Mast has a gross column capacity of 300,000 pounds and a hook load capacity of 210,000 pounds. It will rack 15,000′ of 2⅞″ drill tubing or 6,000′ of 4½″ drill pipe.

FOR DRILLING

. . . On locations in Northern Louisiana and Arkansas, this Ideco DIR-503 is regularly drilling 3,000 to 6,000 feet. Drive-In Ramblers are particularly suited to "slim-hole" drilling to even greater depths. These rigs can be equipped with engines ranging from 114 to nearly 400 horsepower. A wide range of Ideco Hydrair Hoists and Kwik-Lift Masts are available. Ask your Ideco representative for full details on these versatile, highly-mobile, self-propelled rigs.

IDECO DRIVE-INS—four ways faster

faster moves — faster rig-up — faster work — faster rig-down

WRITE FOR BULLETIN DRB-6A

IDECO®

P. O. Box 1331, Dallas, Texas

string set at total depth with 200 sacks of cement. Stage tool at 5,600 ft. with 500 sacks of cement.
Mud: Native and fresh-water gel mud.
Tops: Palo Pinto at 5,100 ft.; Mississippian at 7,870 ft.; Osage at 8,050 ft.; Ellenburger at 8,150 ft.
Core data: Mississippian, 310 ft. interval, 0.35 md. perm., 7.5% porosity, 20% total water sat. Ellenburger, 158 ft. interval, 0.2 to infinity md. perm., 3.8% porosity, 35% total water sat. Water drive.

NEW MAG—OIL CREEK, Grayson County.
Pay: Basal Oil Creek sand. Total depth 13,000 ft.
Costs: Flowing well $440,000. Dry hole $330,000. Footage price $13.90. Day-work rate with pipe $1,150, and without pipe $950.
Rig time: 90% on footage rate. 10% on day-work rate. Total days 140. Total bits 129.
Casing: 13⅜-in. surface casing set at 1,400 ft. with 800 sacks of cement. 9⅝-in. intermediate set at 10,000 ft. with 600 sacks of cement. 5½-in. oil string set at 13,300 ft. with 600 sacks of cement.
Mud: Gel, 2,800 sacks; barite, 4,500 sacks; lignite, 900 sacks; oil, 1,000 bbl.
Tops: Atoka at 8,000 ft.; Viola at 9,800 ft.; Bromide at 10,800 ft.; Oil Creek sand at 12,900 ft.

South Texas

LOPENO, Zapata County.
Pay: 9,100 ft. sand. Total depth 12,349 ft.
Costs: Flowing well $510,000. Day-work rate with pipe $900 plus 1½c per ft.; without pipe $900.
Rig time: 100% on day-work rate. Total days 199. Total bits 104.
Casing: 13⅜-in. surface casing set at 993 ft. with 550 sacks of cement. 9⅝-in. intermediate set at 7,015 ft. with 600 sacks of cement. 5½-in. oil string set at 10,387 ft. with 700 sacks of cement.
Mud: Material: Gel-clay, quebracho, CMC, and high-pH lime mud.
Tops: Sparta at 1,605 ft.; Queen City at 2,190 ft.; Wilcox at 6,700 ft.
Core data: Wilcox formation: 9,130-60 ft. interval; 1-6 md. perm.; 11-25% porosity; 50-86% total water sat.

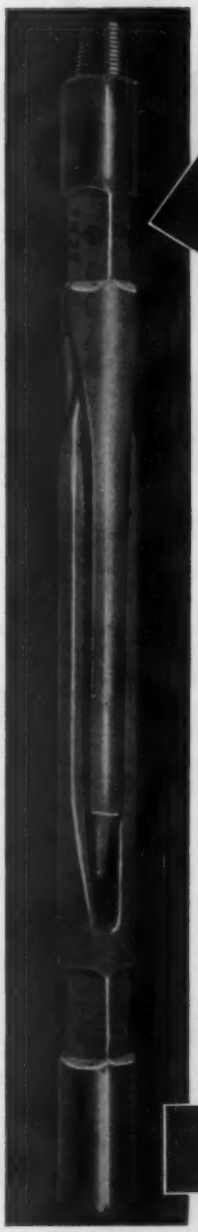
PALACIOS AREA, Matagorda and Calhoun counties.
Pay: E-3 and E-4. Total depth 9,050 ft.
Costs: Flowing well $96,000. Dry hole $75,000. Footage price $2.85. Day-work rate with pipe $875, and without pipe $800.
Rig time: 80% on footage rate. 20% on day-work rate. Total days 22. Total bits 9.
Casing: 9⅝-in. surface casing set at 1,000 ft. with 250 sacks of cement (8% gel). 5½-in. oil string set at 9,050 ft. with 350 sacks of cement (4% gel).
Mud: Reclaimed natural mud treated with 8% oil emulsion has been used exclusively.
Tops: E-3 at 8,990 ft.; E-4 at 9,010 ft.

PERSON, Karnes County.
Pay: Edwards. Total depth 11,000 ft.
Costs: Flowing well $175,000. Dry hole $90,000. Footage price $4. Day-work rate with pipe $1,000 and without pipe $900.
Rig time: 79% on footage rate. 21% on day-work rate. Total days 48. Total bits 25.
Casing: 9⅝-in. surface casing set at 1,800 ft. with 700 sacks of cement. 5½-in. oil string set at 11,000 ft. with 380 sacks of cement.
Mud: Low lime-oil emulsion, 3,000 sacks.
Tops: Edwards at 10,780 ft.

RED FISH REEF, SOUTH, Chambers County.
Pay: Frio 11,325 ft. Total depth 11,400 ft.
Costs: Footage price $5.75. Day-work rate with pipe $1,250, and without pipe $1,150.
Rig time: 80% on footage rate. 20% on day-work rate. Total days 40. Total bits 28.
Casing: 13⅜-in. surface casing set at 200 ft. with 220 sacks of cement. 9⅝-in. intermediate set at 2,000 ft. with 550 sacks of cement. 5½-in. oil string set at 11,400 ft. with 500 sacks of cement.
Mud: Bentonite, 15 sacks; barite, 2,500 sacks; caustic, 10,400 lb.; quebracho, 9,000 lb.; phosphate, 1,030 lb.; gyp., 32,000 lb.; lignosulfonate, 16,000 lb.; oil, 19,000 gal.
Tops: Frio: (F-1) at 9,096 ft.; (F-5) at 9,875 ft.; (F-9) at 10,400 ft.; (F-13) at 11,000 ft.; (F-15) at 11,325 ft.

West Texas

BAKKE, Andrews County.
Pay: Clearfork, Wolfcamp, Pennsylvanian, Devonian, and Ellenburger. Total depth 12,500 ft.
Costs: Flowing well $180,000 in Pennsylvanian and $320,000 in Ellenburger. Footage price $8.75 to $12,500 ft. Day-work rate with pipe $1,050, and without pipe $950.
Rig time: 96% on footage rate. 4% on day-work rate. Total days 90. Total bits 65.
Casing: 13⅜-in. surface casing set at 200 ft. with 275 sacks of cement. 9⅝-in. intermediate set at 4,800 ft. with 2,200



How much "jarring" will the best jars take?

You'll know, when you use ACME Alloy* Steel Jars

**Developed especially for extra wear.*

In Cable Drilling, deep or shallow, a lot depends on the durability of the jars. Acme Alloy Steel Jars are made from a premium grade, high alloy, electric furnace steel, known as chrome-nickel-moly steel. Its deep hardening qualities resist abrasion and its high tensile strength withstands the shock of constant jarring in all Spudder Drilling. Drillers tell us that, compared with other makes they have used, Acme Jars have much longer life without fatigue failure.

A high level of quality control during manufacture, a thorough inspection by Magnaflux, and complete surface conditioning, all go together to assure a product free of defects. For jars that will consistently give you the most service per dollar invested—remember Acme Alloy Steel Jars every time.

TRADE MARK ACME A ALLOY STEEL

ACME warrants all its jars for a specific amount of wear
No time limitation on the WARRANTY

ACME FISHING TOOL CO.

DEPT. 44 • BOX 860 • PARKERSBURG, W. VA.

—SOLD THROUGH DEALERS EVERYWHERE—

Which grade?
50%
73%
CHEMICALS
Key chemical selection in liquid caustic
A key chemical is the best buy. Case in point: liquid caustic. We offer it in two concentrations . . . 50% and 73%. Today, your best buy may be the 50% grade. If so, that's what we'll recommend—today. But if stepped-up use of caustic or changes in freight rates alter your economic position in the future—we'll recommend conversion. We never consider our first analysis final . . . and never stop working with you.
WYANDOTTE
MICHIGAN ALKALI DIVISION, WYANDOTTE, MICHIGAN

sacks of cement. 7 or 5½-in. oil string set at 12,500 ft. with 800 sacks of cement.
Mud: Salt-gel, 50 sacks; bentonite, 800-1,200 sacks; CMC, 100 sacks; diesel oil, 300 bbl.
Tops: San Andres at 4,400 ft.; Wolfcamp at 8,500 ft.; Pennsylvanian at 9,000 ft.; Devonian at 10,500 ft.; Ellenburger at 12,300 ft.
Core data: Wolfcamp, 8,500-8,600 ft. interval; 62 md. perm.; 11% porosity; 12% resid. oil sat.; 38% total water sat. Pennsylvanian, 9,000-9,200 ft. interval, 20 md. perm.; 8% porosity; 8% resid. oil sat.; 46% total water sat. Ellenburger, 12,300-12,500 ft. interval; 2 (frac) md. perm.; 2.7% porosity; 11% resid. oil sat.; 45% total water sat.

BLACKSTONE-SLAUGHTER, Pecos County.
Pay: Pennsylvanian-Ellenburger.
Costs: Footage price $9.40. Day-work rate with pipe $1,075 and without pipe $925.
Rig time: 75% on footage rate. 25% on day-work rate. Total days 100. Total bits 100.
Casing: 13⅜-in. surface casing set at 400 ft. with 540 cu. ft. of cement. 9⅝-in. intermediate set at 1,800 ft. with 1,730 cu. ft. of cement. 7-in. oil string set at 10,000 ft. with 600 cu. ft. of cement. 6-in. open hole into Ellenburger.
Mud: Water to 8,000 ft., low solids-CMC thereafter to total depth. Native to 8,00 ft. Total mud cost $10,000.
Tops: Pennsylvanian at 8,193 ft.; Ellenburger at 10,052 ft.

BROWN-BASSET, Terrell County.
Pay: Ellenburger. Total depth 15,000 ft.
Costs: Flowing well $500,000. Day-work rate with pipe $1,100 and without pipe $880.
Rig time: 100% day-work rate. Total days 60-100. Total bits 30-60.
Casing: 13⅜-in. surface casing at 1,000 ft. with 1,180 cu. ft. of cement. 9⅝-in. intermediate set at 7,000 ft. with 3,380 cu. ft. of cement. 7-in. oil string set at 14,000 ft. with 1,600 cu. ft. of cement. 6-in. open hole in Ellenburger.
Mud: Spud mud, gas (or low solids-CMC), and inverted emulsion. Total mud cost: $30,000.
Tops: Ellenburger at 14,000 ft.

FOSTER, Ector County.
Pay: Grayburg. Total depth 4,250 ft.
Costs: Flowing well $45,000. On pump $55,000. Dry hole $30,000. Footage price $3. Day-work rate with pipe $650, and without pipe $600.
Rig time: 80% on footage rate. 20% on day-work rate. Total days 8. Total bits 10.
Casing: 8⅝-in. surface casing set at 250 ft. with 175 sacks of cement. 5½-in. oil string set at 4,250 ft. with 200 sacks of cement.
Mud: Salt gel, 120 sacks; oil, 100 bbl.; starch, 20 sacks.
Tops: Red beds at 90 ft.; Grayburg at 3,940 ft.

FULLERTON, Andrews County.
Pay: Clearfork. Total depth 7,223 ft.
Costs: Flowing well $81,200. Footage price $4.50. Day-work rate with pipe $775, and without pipe, $725.
Rig time: 90% on footage rate. 10% on day-work rate. Total days 20. Total bits 24.
Casing: 8⅝-in. surface casing set at 1,804 ft. with 680 sacks of cement. 4½-in. oil string set at 7,222 ft. with 540 sacks of cement.
Mud: Sodium soap, 27 sacks, oil, 270 bbl.;

Drawworks with Guts to Go ...for Years

No lightweights, those Brewster drawworks. There's a legion of men in the oil world who will testify to that.

TAKE BREWSTER'S N-55 ROTARY RIG DRAWWORKS

This medium depth drawworks has the ruggedness and brawn typical of all Brewster drawworks. Depth rated to 8,000 feet with 4½" drill pipe, it uses a maximum of 600 horsepower. Clutches are mounted outboard on the main drum shaft for ease of servicing. The entire drum shaft assembly is a complete unit and may be removed in the field for maintenance or service. The drum core is formed from thick walled steel, heavily ribbed to prevent crushing.

TRANSMISSION

The compact chain transmission features Brewster's field proved graduated speed design with four forward speeds, each a 38% increase. When combined with the high and low drum drives, eight forward and two reverse speeds are available for hoisting. Four forward and two reverse speeds are available to the rotary.

COMPOUND

Box type oil bath roller chain compounds are provided for either two or three engine hook-up. By means of individual clutches, motors may be used singly or in combination for individual operation of the pump and drawworks. Fawick air clutches connect each engine to compound shafts, thus providing air-cushioned power, and eliminating many parts.

BRAKES

Brakes are full 325° wrap, having 1" x 8" linings on 40" diameter drums, with a total braking surface of 1,728 square inches. They are of the compound equalizing type and are self-energizing to provide holding power with minimum manual effort.

Get complete information on Brewster equipment now. See your Brewster dealer or write or call Brewster.

SPECIFICATIONS BREWSTER N-55

Recommended Horsepower	600
Drum Brake Diameter x Width	40" x 8"
Drum Core Diameter x Length	18" x 40"
Size of Brake Lining	1" x 8"
Net Braking Surface (Lining) Square Inches	1,728
High Speed Drum Clutch	Fawick Friction
Low Speed Drum Clutch	Fawick with Positive Auxiliary
Transmission:	
Forward Speeds	4
Reverse Speeds	1
Size Main Skid Members	12 x 12 H
Approx. Overall Height	72"
Approx. Width of Skids	7' 1"
Length	25' 8"—2 Eng.
Length	30' 10"—3 Eng.
Approx. Weight of Drawworks, less engines	36,000 lbs.

Brewster MATCHED Drilling Equipment for the N-55 Drawworks includes the Model TB-16 Block, the RSH-16 Rotary and the 4-5/8" Oil Base Swivel.

BREWSTER N-55 ROTARY RIG DRAWWORKS

Fast drawworks for medium depth drilling available with Torque Converter, Fluid Couplings or Direct Mechanical Drive

THE BREWSTER COMPANY, INC.

P. O. BOX 1095, SHREVEPORT, LOUISIANA
TELEPHONE 424-3254

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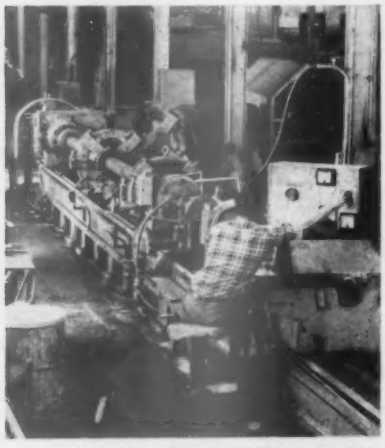
DRILL COLLARS IN THE "RAW"

These CP Drill Collar blanks started with an exact metallurgical analysis . . . were then heat treated to develop the ideal characteristics of strength and wear resistance precisely right for your needs.

You can't buy a better Drill Collar than CP. Precision bored on our own trepanning machines they are "perfect in every detail" . . . thread form . . . wall thickness . . . balance . . . metallurgy.

Insist on CP Drill Collars, they'll provide the weight and give your string the true-running qualities that make holes faster. And they'll be delivered right on schedule.

At CP we know that you've "no time for downtime."



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starch, 25 sacks; gel 15 sacks; lost-circulation material (fiber, mud seal), 25 sacks.

Tops: San Andres at 4,442 ft.; Glorieta at 5,595 ft.; Clearfork at 6,152 ft.; Tubb (Lower Clearfork) at 6,708 ft. (54-ft. thick, net).

HOWARD GLASSCOCK, Howard County.
Pay: San Andres and San Angelo. Total depth 3,000 ft.
Costs: Well on pump $30,000. Dry hole $11,000. Footage price $2.80. Day-work rate with pipe $550, and without pipe $500.
Rig time: 98% on footage rate. 2% on day-work rate. Total days 9. Total bits 8.
Casing: 8⅝-in surface casing set at 160 ft. with 150 sacks of cement. 5½-in. oil string set at TD with 75 sacks of cement. Using 4½-in. also.
Mud: Water to 2,000 ft. Gel, starch, and preservative. Mud cost is $1,500 to $2,000.
Tops: Yates at 1,250 ft.; San Andres at 2,000 ft., San Angelo at 2,800 ft.
Core data: San Andres, 2,170-2,286 ft. interval; 0.9 md. perm.; 10.5% porosity; 10% resid. oil sat. 61.3% total water sat. San Angelo, 2,822-40 ft. interval; 0.6 md. perm.; 15.9% porosity; 18.4% resid. oil sat. 51.7% total water sat.
Estimated recovery in bbl. per acre-ft. (gas expansion or water drive): San Andres 50 (gas); 191 (water). San Angelo 102 (gas); 295 (water).

McELROY, Crane County.
Pay: Greenburg. Total depth 3,100 ft.
Costs: Flowing well $41,000. On pump $47,000. Dry hole $20,000. Footage price $3.50. Day-work rate with drill pipe $650, and without pipe $400.
Rig time: 97% on footage rate. 3% on day-work rate. Total days 7. Total bits 11.
Casing: 8⅝-in. surface casing set at 550 ft. with 350 sacks of cement. 5½-in. oil string set at 3,100 ft. with 1,000 sacks of cement.
Mud: Gel, 75 sacks; starch, 50 sacks. Note: Spud mud for surface and clear water to 2,700 ft. Through pay zone, starch, salt gel, and oil are used.
Tops: Yates at 7,000 ft.; Grayburg at 7,950 ft.

NORTH COWDEN, Ector County.
Pay: Grayburg. Total depth 4,700 ft.
Costs: Flowing well $36,000. On pump $48,000. Dry hole $33,000. Footage price $3.25. Day-work rate with pipe $750, and without pipe $675.
Rig time: 80% on footage rate. 20% on day-work rate. Total days 9. Total bits 16.
Casing: 8⅝-in. surface casing set at 215 ft. with 200 sacks of cement. 4½-in. oil string set at 4,700 ft. with 1,200 sacks of cement.
Mud: Bentonite and lime. Fresh water becoming salt saturated.
Tops: Brown lime at 4,000 ft.; Grayburg at 4,350 ft.

PENWELL, Ector County.
Pay: San Andres. Total depth 3,800 ft.
Costs: Flowing well $45,000. On pump $55,000. Dry hole $19,000. Footage price $2.80. Day-work rate with pipe $625, and without pipe $550.
Rig time: 90% on footage rate. 10% on day-work rate. Total days 8. Total bits 10.
Casing: 8⅝-in. surface casing set at 750 ft. with 400 sacks of cement. 5½-in. oil string at 3,800 ft. with 900 sacks of cement.
Mud: Fresh water gel and oil emulsion, 100 sacks.
Tops: Yates at 2,100 ft.; Grayburg at 3,100 ft.; San Andres at 3,500 ft.
Core data: San Andres, 3,545-91 ft. interval; 1.4 md. perm., 6.8% porosity; 7.7% resid. oil sat.; 66.5% total water sat. San Andres, 3,575-3,797 ft. interval; 1.9 md. perm.; 5.9% porosity; 9% resid. oil sat.; 67.6% total water sat. San Andres, 3,636-88 ft. interval, 0.8 md. perm.; 5.8% porosity; 9.6% resid. oil sat.; 60.1% total water sat.
Estimated recovery in bbl. per acre-ft. (gas expansion): San Andres 3,545-91 ft., 58; San Andres 3,575-3,797, 35; San Andres 3,636-88, 46.

PUCKETT, Pecos County.
Pay: Devonian (gas). Total depth 10,800 ft.
Costs: Flowing $300,000. Dry hole $200,000. Footage price $9.60. Day-work rate with pipe $1,050, and without pipe $950.
Rig time: 85% on footage rate. 15% on day-work rate. Total days 84. Total bits 72.
Casing: 13⅜-in. surface casing set at 1,250 ft. with 900 sacks of cement. 9⅝-in. intermediate at 6,000 ft. with 1,400 sacks of cement. 5½-in. oil string set at 10,800 ft. with 2,000 sacks of cement.
Mud: Gel and hulls, 2,000 sacks; salt mud, 150 sacks.
Tops: Devonian at 10,500 ft.

ROJO CABALLOS, Pecos County.
Pay: Penn lime. Total depth 15,750 ft.
Costs: Flowing well $1,500,000. Footage price $12.25-$14.25. Day-work rate with pipe $1,100-$1,500 and without pipe $950-$1,200.
Rig time: 28% on footage rate. 72% day-work rate. Total days 375. Total bits 142.
Casing: 20-in. surface casing set at 400 ft. with 400 sacks of cement. 13⅜-in. intermediate set at 6,000 ft. with 5,500 sacks of cement. 9⅝-in. oil string set at 13,200 ft. with 5,300 sacks of cement. 7⅝-in. at 15,500 ft. with 1,300 sacks of cement.
Mud: Weight material, bentonite, gypsum, ferrochrome lignosulfonate, CMC. 8,000,000 lb. total mud.
Tops: Penn lime at 15,100 ft.; Wolfcamp at 10,300 ft.; Delaware group at 5,250 ft.

TXL-TUBB, Ector County.
Pay: Tubb sand. Total depth 6,600 ft.
Costs: Flowing well $68,000. On pump $80,000. Dry hole $41,000. Footage price $4.75. Day-work rate with pipe $675, and without pipe $625.
Rig time: 83% on footage rate. 17% on day-work rate. Total days 28. Total bits 26.
Casing: 9⅝-in. surface casing set at 1,500 ft. with 400 sacks of cement. 5½-in. oil string at 6,600 ft. with 200 sacks of cement.
Mud: Gel, 80 sacks; starch, 55 sacks; crude oil, 200 bbl.; emulsifier, 87 sacks.
Tops: Red Bed at 90-1,000 ft.; San Andres at 4,110 ft.; Glorieta at 5,150 ft.; Clearfork at 5,474 ft.; Tubb at 6,022 ft.

TXL-WOLFCAMP (NORTH), Ector County.
Pay: 7,550-ft. Wilcox. Total depth 7,780.
Costs: Flowing well $107,000. On pump $120,000. Dry hole $85,000. Footage price $5.75. Day-work with pipe $700, and without pipe $600.
Rig time: 98% on footage rate. 2% on day-work rate. Total days 31. Total bits 34.
Casing: 8⅝-in. surface casing set at 1,401

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ft. with 505 sacks of cement. 4½-in oil string at 7,780 ft. with 705 sacks of cement.
Mud: Bentonite, 23 sacks; mud seal, 29 sacks; CMC, 1,250 lb.; crude oil, 194 bbl.; brine water, 2,680 bbl.
Tops: San Andres at 4,078 ft.; Upper Clearfork at 5,455 ft.; Tubb at 6,020 ft.; Wolfcamp at 7,556.
Estimated recovery in bbl. per acre-ft. (solution gas drive): 78.

UNIVERSITY-WADDELL, Crane County.
Pay: Devonian. Total depth 9,400 ft.
Costs: Flowing well $190,000. On pump $202,000. Dry hole $175,000. Footage price $6.75. Day-work rate with pipe $1,000, and without pipe $900.
Rig time: 80% on footage rate. 20% on day-work rate. Total days 50. Total bits 35.
Casing: 13⅜-in. surface casing set at 800 ft. with 800 sacks of cement. 9⅝-in. intermediate at 4,300 ft. with 2,000 sacks of cement. 7-in. oil string at 9,400 ft. with 850 sacks of cement.
Mud: Gel, 50 sacks; caustic, 500 lb.; quebracho, 500 lb.; lease oil, 500 bbl.; fresh water.
Tops: Rustler anhydrite at 1,050 ft.; Grayburg at 3,025 ft.; Pennsylvanian at 7,600 ft.; Devonian at 8,600 ft.

WASSON, Gaines County.
Pay: Upper and Lower Clearfork (Permian). Total depth 7,600 ft.
Costs: Flowing well $125,000. On pump $160,000. Dry hole $65,000. Footage price $4.10. Day-work rate with pipe $750, and without pipe $675.
Rig time: 90% on footage rate; 10% on day-work rate. Total days 22. Total bits 30.
Casing: 13⅜-in. surface casing set at 380 ft. with 450 sacks of cement. 9⅝-in. intermediate at 3,300 ft. with 1,400 sacks of cement. 7-in. oil string at 7,200 ft. with 700 sacks of cement. Two strings of tubing.
Mud: Oil-water emulsion; gel, 84 sacks; emulsifier, 87 sacks; starch, 55 sacks; minor amounts of other materials including 250 bbl. oil.

Utah

ANETH AREA, San Juan County.
Pay: Hermosa. Total depth 5,700 ft.
Costs: Flowing $120,000. On pump $135,000. Dry hole $95,000. Footage price $9. Day-work rate with pipe $900, and without pipe $825.
Rig time: 92% on footage rate. 8% on day-work rate. Total days 28. Total bits 35.
Casing: 10¾-in. surface casing set at 1,200 ft. with 700 sacks of cement, 7-in. oil string at 5,700 ft. with 900 sacks of cement.
Mud: Barites, 5,000 lb.; bentonites, 10,000 lb.; preservatives, 1,500 lb.; salt-water gel, 5,000 lb.; starch, 10,000 lb.
Tops: De Chelly at 2,600 ft.; Organ Rock at 2,700 ft.; Hermosa at 4,520 ft.; Ismay at 5,320 ft.; Paradox shale at 5,455 ft.; Aneth at 5,465 ft.; Chimney Rock at 5,660 ft.; Salt at 5,680 ft.

RED WASH, Uintah County.
Pay: Lower Green River. Total depth 5,800 ft.
Costs: On pump $125,000. Dry hole $85,000. Footage price $5. Day-work rate with pipe $825, and without pipe $800.
Rig time: 95% on footage rate. 5% on day-work rate. Total days 22. Total bits 35.
Casing: 10¾-in. surface casing set at 225 ft. with 180 sacks of cement. 7-in. or

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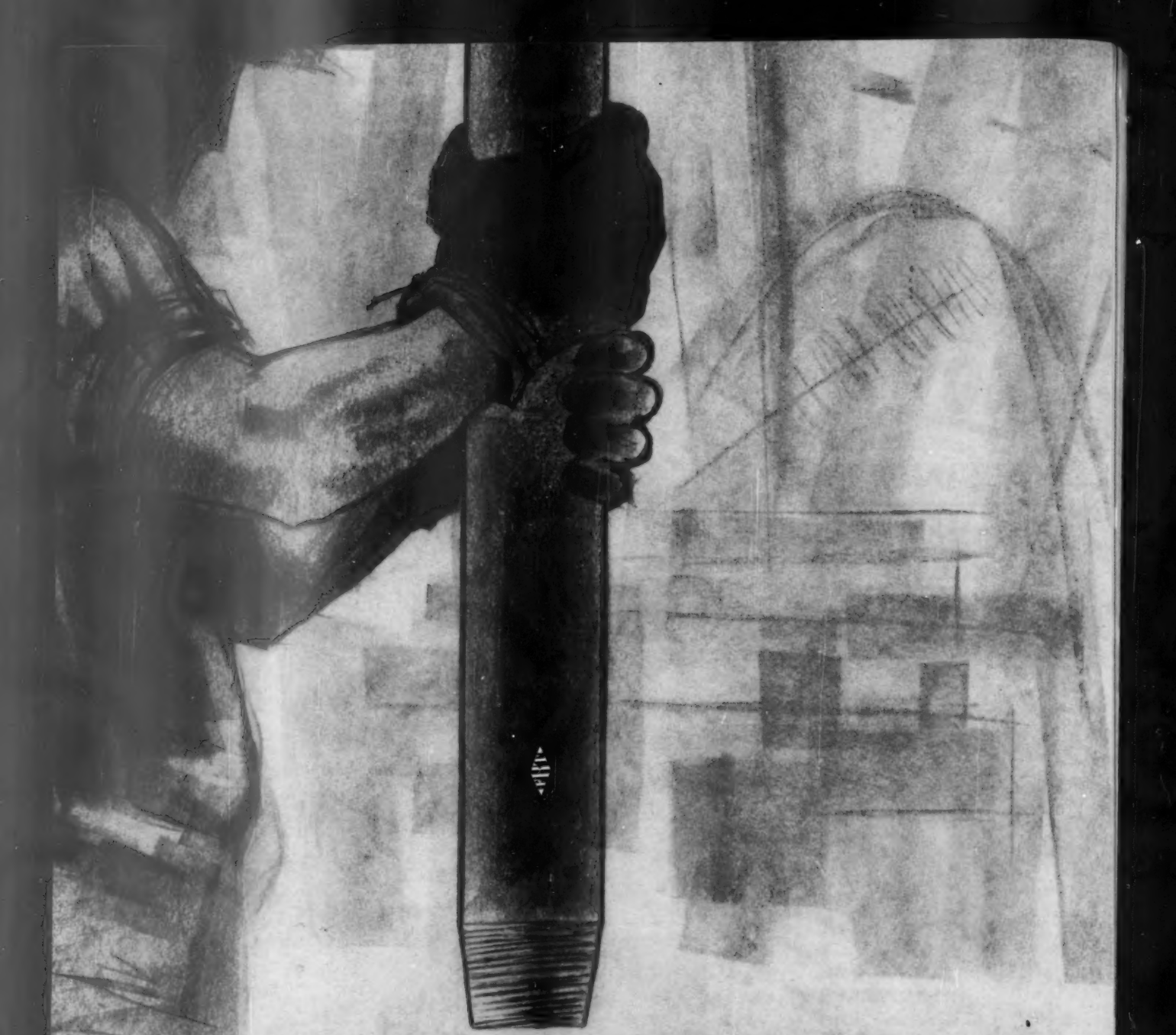

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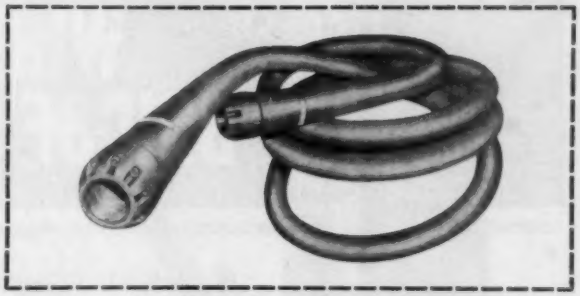

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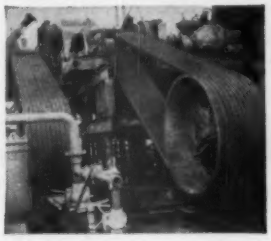

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No whip, no wobble, no weave —no undue stress or belt turnover on long center, heavy duty drives with Condor LS V-Belts. They're *length stabilized*—to give a degree of lateral and longitudinal stability *without stretch* never before possible. Each belt is factory measured, length certified and tagged. They come matched—stay matched on the drive! Write for Bulletin M210.

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R/M Asbestos-"Teflon" braided packings on valves and pumps eliminate the kind of troubles you normally experience with strong acids, corrosive liquids, and other chemicals. They represent the most effective combination of materials for this kind of service. And they require no lubrication, offer low breakaway friction. For complete information, write for Catalog 8904.

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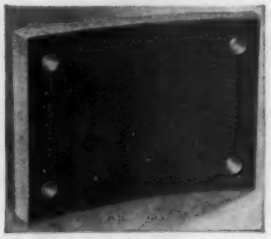

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RM108

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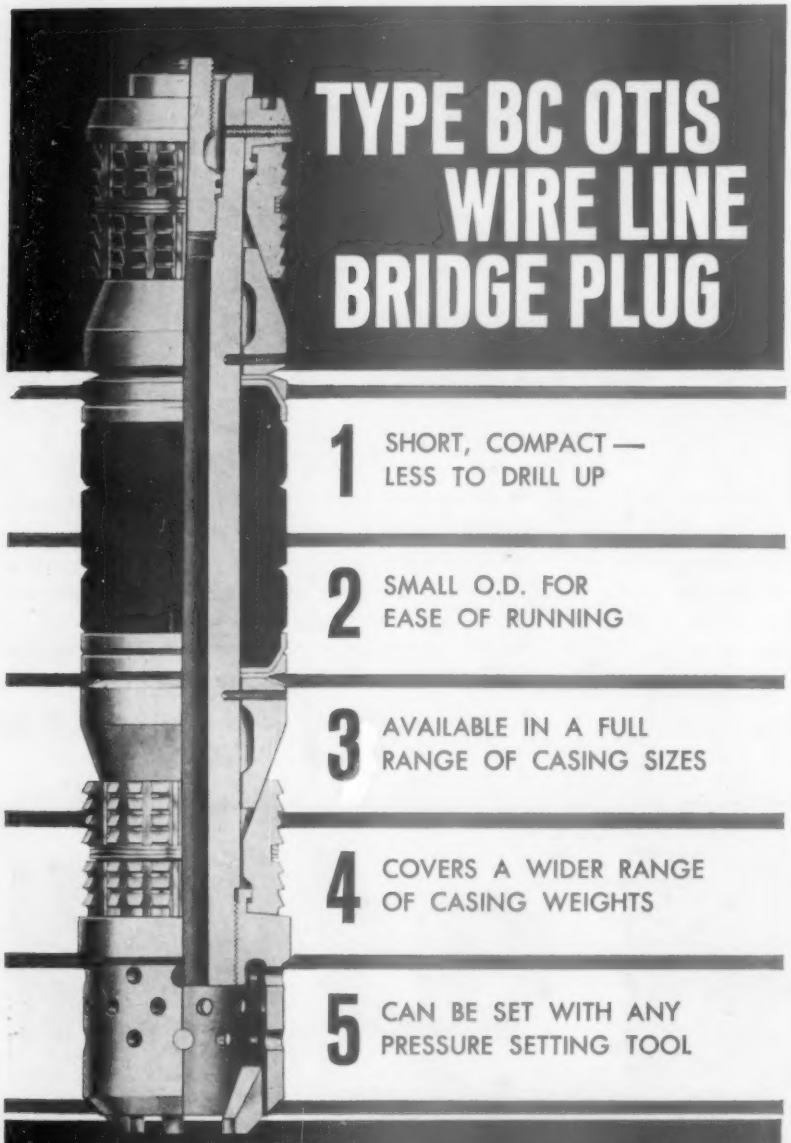

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Every time you specify the Type BC Otis Wire Line Bridge Plug, you get 5 plus features designed to help you take the guesswork out of your plugging operations—and yet the plug costs you no more than an ordinary plug. For this reason, many operators have standardized on the Type BC. They found they could successfully run the Type BC where other plugs failed to get down. In addition to the 5 big advantages you get with a Type BC Bridge Plug, you will find it's available from leading electric line service companies and stocked in over 200 different field locations — wherever you need it. Take the guesswork out of your plugging operations — the next time you need a bridge plug, specify Otis.

Type BC Otis Wire Line Bridge Plugs are available in these sizes:

SIZES	CASING WEIGHTS	SIZES	CASING WEIGHTS
2⅞"	6.4 — 8.6 lb.	5½"	13 — 20 Lb.
4½"	11.6 — 15.1 Lb.	6⅝"	17 — 24 Lb.
4½"	9.5 Lb.	7"	20 — 38 Lb.
5"	18.0 Lb.	9⅝"	43.5 — 53.5 Lb.

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5½-in. oil string at 5,700 ft. with 400 sacks of cement.

Mud: Bentonite, 150 sacks; caustic soda, 600 lb.; lignite, 2,000 lb.; cost is about $4,500.

Tops: Uinta, surface; Green River, 3,000 ft. Wasatch 5,850 ft.

Core data: Green River; 4,400-5,800 ft. interval; 125 md. perm.; 16% porosity; 25% resid. oil sat.; 35% total water sat.

Wyoming

BIG PINEY, Sublette County.

Pay: Mesaverde. Total depth 3,300 ft.

Costs: Flowing well $45,000. On pump $55,000. Dry hole $25,000. Footage price $3.75. Day-work rate with pipe $750, and without pipe $700.

Rig time: 90% on footage rate. 10% on day-work rate. Total days 10. Total bits 9.

Casing: 8⅝-in. surface casing set at 250 ft. with 150 sacks of cement. 5½-in. oil string at 3,250 ft. with 400 sacks of cement.

Mud: Gel, 150 sacks; caustic, 100 lb.; thinner, 400 lb.; oil 8%.

Tops: Mesaverde at 3,150 ft.; Olney at 1,750 ft.

Core data: Mesaverde 85 ft. interval; 10 md. perm., 18% porosity; 20% resid. oil sat.; 51% total water sat.

DEAD HORSE CREEK, Campbell County.

Pay: Ferguson sand (Mesaverde). Total depth 6,900 ft.

Costs: Flowing well $54,000 (tubingless completion—most operators use 5½-in. casing and 2⅞-in. tubing which would increase cost by $13,000). On pump $70,000 (does not include tank battery and flow lines). Dry hole $36,000. Footage price $2.50. Day-work rate with pipe $850 and without pipe $800.

Rig time: 88% on footage rate. 12% on day-work rate. Total days 11. Total bits 15.

Casing: 8⅝-in. surface casing set at 300 ft. with 200 sacks of cement. 2⅞-in. oil string set at 6,900 ft. with 150 sacks of cement.

Mud: Bentonite, 350 sacks; lost-circulation material, 150 sacks; thinner, 40 sacks; miscellaneous, 30 sacks.

Tops: Fort Union at 1,100 ft.; Lewis at 6,200 ft.; Teapot at 6,700 ft.; Ferguson at 6,850 ft.; Parkman at 6,900 ft.

Core data: Ferguson, 12 ft. (net) interval, 44 md. perm., 17% porosity.

Estimated recovery bbl. per acre-ft.: 50 to 80. Solution-gas drive.

HAMILTON DOME, Hot Springs County.

Pay: Tensleep. Total depth 3,200 ft.

Costs: On pump $58,200. Footage price $6.50. Day-work rate with pipe $700, and without pipe $650.

Rig time: 89% on footage rate. 11% on day-work rate. Total days 19. Total bits 20.

Casing: 10¾-in. surface casing set at 100 ft. with 100 sacks of cement. 7-in. oil string at 3,200 ft. with 250 sacks of cement.

Mud: Gel, 23,500 lb.; starch, 5,000 lb.; caustic, 700 lb.; lime, 2,300 lb.; viscosifier, 550 lb.; diesel oil, 3,000 gal.

Tops: Chugwater at 1,600 ft.; Embar at 2,800 ft.; Tensleep at 3,000 ft.

Remarks: Contract includes 24-hour lost-circulation clause, 5° vertical-deviation limit as some areas present crooked-hole problems.

LA BARGE, Sublette County.

Pay: First and Second Frontier. Total depth 7,000 ft.

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Costs: Flowing well $140,000. Dry hole $80,000. Footage price $6.25. Day-work rate with drill pipe $850, and without pipe $800.

Rig time: 80% on footage rate. 20% on day-work rate. Total days 40.

Casing: 10¾-in. surface casing set at 1,250 ft. 7-in. oil string set at 7,000 ft.

Mud: Gel, 10 to 12 lb. per gal.

Tops: Almy at surface; Hilliard at 1,200 ft.; Frontier at 6,000 ft.; First Frontier at 6,100 ft.; Second Frontier at 6,500 ft.

MILLER CREEK, Crook County.

Pay: Dakota. Total depth 6,000 ft.

Costs: Flowing well $56,000. On pump $62,000. Dry hole $27,000. Footage price $3.15. Day-work rate with pipe $875, and without pipe $825.

Rig time: 85% on footage rate. 15% on day-work rate. Total days 12. Total bits 8.

Casing: 8⅝-in. surface casing set at 200 ft. 5½-in. oil string.

Tops: Dakota at 5,900 ft. 0-50-ft. thick.

Core data: Dakota, 11 ft. interval; 14.2% porosity; 50% total water sat. Dakota, 27 ft. interval; 19.1% porosity; 41.3% total water sat.

Estimated recovery, bbl. per acre-ft. (gas expansion): Dakota 11 ft. interval, 103; Dakota 27 ft. interval, 140.

PATRICK DRAW, Sweetwater County.

Pay: Almond. Total depth 5,100 ft.

Costs: Flowing well $55,000. Dry hole $25,000. Footage price $3.25. Day-work rate with pipe $750, and without pipe $700.

Rig time: 85% on footage rate. 15% on day-work rate. Total days 13. Total bits 7.

Casing: 8⅝-in. surface casing set at 300 ft. with 180 sacks of cement, 5½-in. oil string at 5,000 ft. with 80 sacks of cement.

Mud: Bentonites, 500 lb.; preservatives, 100 lb.

Tops: Lewis at 3,500 ft.; Almond at 4,900 ft.; Erickson at 5,200 ft.

Core data: Almond, 25 ft. interval; 12 md. perm.; 18.5% porosity; 18% resid. oil sat.; 37.5% total water sat.

RAVEN CREEK, Campbell County.

Pay: Minnelusa. Total depth 8,500 ft.

Costs: Well on pump $115,000. Dry hole $40,000. Footage price $3.65. Day-work rate with pipe $1,000 and without pipe $900.

Rig time: 95% on footage rate. 5% day-work rate. Total days 21. Total bits 22.

Casing: 8⅝-in. surface casing set at 650 ft. with 400 sacks of cement. 5½-in. oil string set at 8,500 ft. with 400 sacks of cement.

Tops: Niobrara at 5,200 ft.; Muddy at 6,800 ft.; Minnelusa at 8,300 ft.

ROZET, Campbell County

Pay: Muddy sandstone. Total depth 7,000 ft.

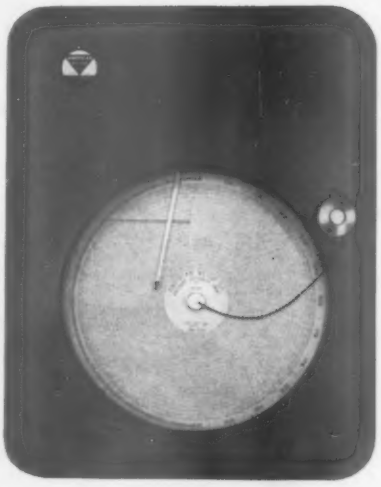
Costs: On pump $82,500. Footage price $2.88. Day-work rate with pipe $850, and without pipe $750.

Rig time: 95% on footage rate. 5% on day-work rate. Total days 11. Total bits 12.

Casing: 10¾-in. surface casing set at 200 ft. with 150 sacks of cement. 5½-in. oil string at 7,000 ft. with 250 sacks of cement.

Mud: Native mud to top of Muddy sand. Low water loss, 20% oil-emulsion mud through pay zone.

PRESSURE and TEMPERATURE RECORDERS



American® single and two-pen Pressure Recorders for pressures from 30 inches vacuum to 10,000 psi.

- Pressure elements individually calibrated over full range.
- Variety of chart drives available.*
- Helical elements of different ranges are interchangeable.
- Aluminum alloy, dust and moisture-proof case.

See Bulletin 400.

American Temperature Recorders for an accurate record of flowing temperatures.

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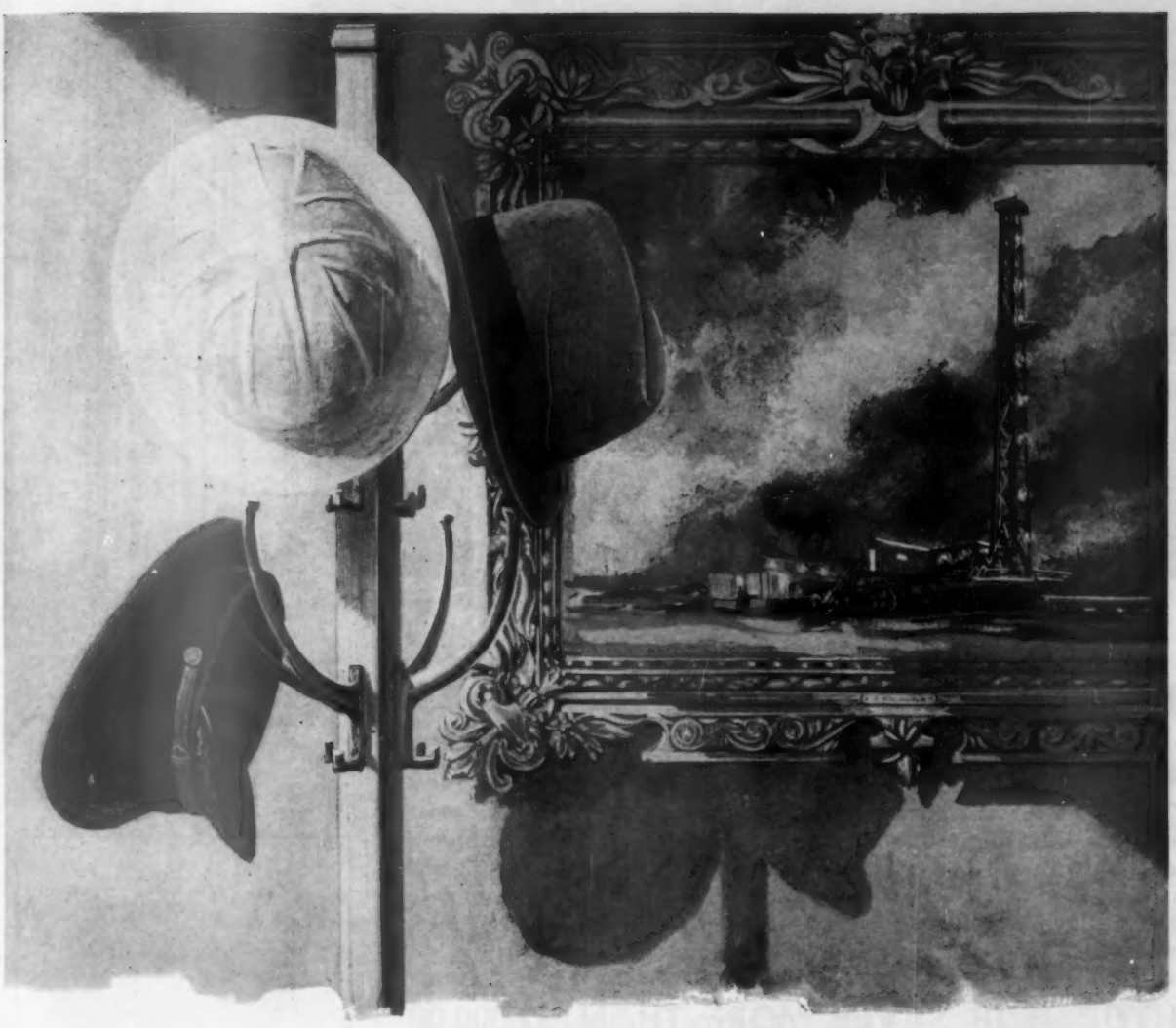

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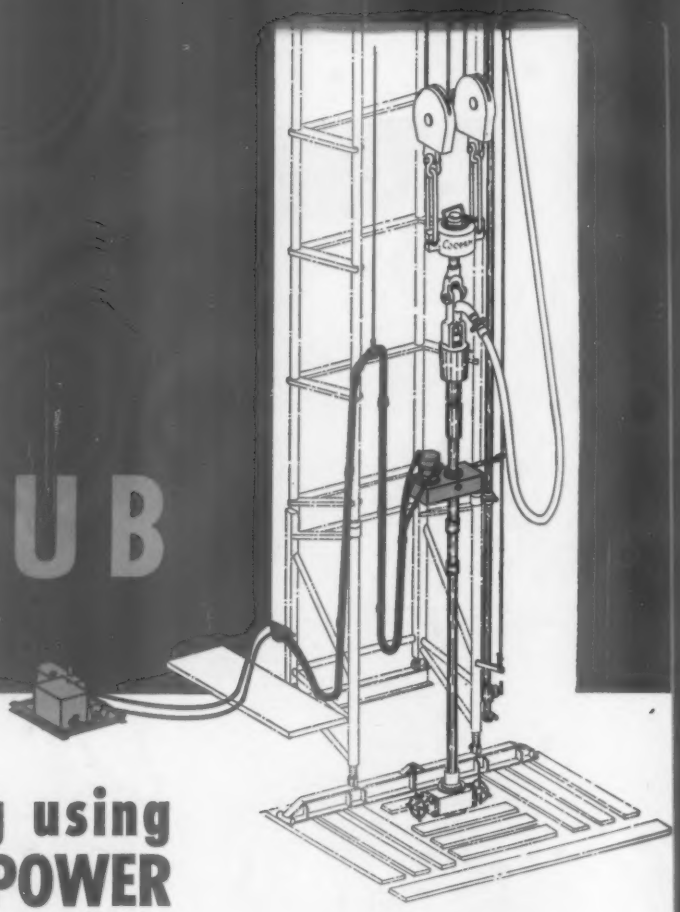
COOPER'S NEW

HYDRA-SUB



rotates the drill string using AVAILABLE HYDRAULIC POWER

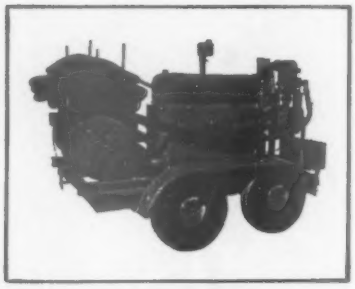
This new tool is designed for drilling and workovers. It is positioned on the drill string just under the swivel and on top of the drill pipe. As the hydraulic power is delivered through hoses the Hydra-Sub is free to move up and down in the derrick. This gives complete flexibility for fishing tool, workover or drilling operations. Rotation with the drill string is prevented by torque arms which travel on stabilizing lines in the derrick. Any standard swivel may be used.

HYDRA-SUB SAVES MORE THAN $2,000.00 OVER CONVENTIONAL ROTARY METHOD

A comparison of costs shows that the model 6030 rated at 30 H.P. which is suitable for most workovers and shallow or slim hole drilling, costs much less and has many advantages over older methods of rotating the drill string. The 6030 operates from most hydraulic systems on derricks or power tool systems.

NOW YOU DON'T NEED Rotary table, kelly, rotary drive sprockets and clutches — drive chains — chain guards or substructures to hold table.

YOU GET Fluid drive eliminating shock loads on drill string — reduces hazards and prolongs life of drill pipe. Accurate predetermined, torque control which protects threads, prevents twist-offs, makes possible continuous coring — has the flexibility for any job. Easily transferred from rig to rig.



Cooper trailer mounted Hydraulic Power Source and Model 6060 Hydra-Sub complete — ready for the road.

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COOPER POWER SOURCE

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ORIGINATOR OF MOBILE WINCH UNITS

Tops: Muddy at 6,925 ft.
Core data: Muddy 24 ft. interval; 26.5 md. perm.; 18.2% porosity; 12.7% resid. oil sat.; 56.1% total water sat.
Estimated recovery, bbl. per acre-ft. (gas expansion): 95.

WEST DESERT SPRINGS, Sweetwater County.
Pay: Lewis and Almond. Total depth 6,000 ft.
Costs: Flowing well $110,000. Dry hole $60,000. Footage price $7. Day-work rate with drill pipe $900, and without pipe $775.
Rig time: 95% on footage rate. 5% on day-work rate Total days 25. Total bits 20.
Casing: 10¾-in. surface casing set at 450 ft. with 200 sacks of cement. 5½-in. oil string set at 6,000 ft. with 500 sacks of cement.
Mud: Gel, fresh-water 10-lb. weight.
Tops: Lewis at 5,000 ft.; Almond at 5,400 ft.; Erickson at 6,000 ft.

Canada

CAROLINE - GARRINGTON AREA, Alberta.
Pay: Cardium "B" sand. Total depth 7,100 ft.
Costs: Flowing well $60,000. On pump $75,000. Dry hole $40,000. Footage price $3 00. Day-work rate with pipe $950 and without pipe $850.
Rig time: 90% on footage rate. 10% on day-work rate. Total days 21. Total bits 22.
Casing: 8⅝-in. surface casing set at 710 ft. with 375 sacks of cement. 4½-in. or 3½-in. (slim-hole tubingless) at 7,100 ft. with 200 sacks of cement.
Mud: Gel, 200 sacks; caustic, 1 can; CMC, 4 sacks; sodium soap, 8 sacks; oil, 80 bbl.
Tops: Lea Park at 5,225 ft.; First White Specks at 5,650 ft.; Cardium "A" sand at 6,450 ft.; Cardium "B" sand at 6,570 ft.
Core data: Cardium "A," 6 ft. interval, 1-2 md. perm , 7% porosity. Cardium "B," 10-ft. interval, 30 md. perm., 12% porosity.
Estimated recovery, bbl. per acre-ft.: Cardium "A," 31; Cardium "B," 50.

CROSSFIELD, Alberta.
Pay: Cardium. Total depth 6,750 ft.
Costs: Flowing well $65,000. Footage price $4.00. Day-work rate with pipe $780.
Rig time: 96% on footage rate. 4% on day-work rate.
Casing: 8⅝-in. surface casing set at 660 ft. with 350 sacks of cement. 2⅞-in oil string at 6,754 ft. with 700 sacks of cement.
Tops: Basal Belly River at 5,231 ft.; Colorado at 5,731 ft.; Cardium at 6,548 ft.; Lower Cardium at 6,733 ft.
Core data: Lower Cardium 40 ft. interval; 19.0 md. perm.; 16.5% porosity; 36.5% resid. oil sat.; 22.1% total water sat.
Estimated recovery, bbl. per acre-ft. (gas expansion): 150

PEMBINA, Alberta.
Pay: Cardium. Total depth 4,250 ft.
Costs: Flowing well $42,000. On pump $48,000. Dry hole $25,000. Footage price $2.25. Hourly rate with pipe $34 and without pipe $31.
Rig time: 90% on footage rate. 10% on day-work rate. Total days 5. Total bits 5.
Casing: 7-in. surface casing and 4½-in. oil string.
Tops: Cardium at 4,250 ft.
Core data: Cardium, 4,245-50 ft. interval, 100 md. perm., 15% porosity, 10% total water sat.

SWAN HILLS, Alberta.
Pay: Beaverhill Lake (Mid - Devonian). Total depth 8,400 ft.
Costs: Flowing well $175,000. Dry hole $125,000. Footage price $5.50. Day-work rate with pipe $1,050, and without pipe $1,000.
Rig time: 85% on footage rate. 15% on day-work rate. Total days 38. Total bits 30.
Casing: 10¾-in. surface casing set at 600 ft. with 600 sacks of cement. 5½-in. oil string seated at 8,400 ft. with 400 sacks of cement. (Around show; used staging collars and cemented 200 ft. above second Specks.)
Mud: Water-gel emulsion mud below 5% by volume with oil, or diesel-base mud. Serious shale sluff; experimented with shale-resistant mud.
Tops: Second Specks at 3,200 ft.; Blairmore at 4,016 ft.; Wabamun at 5,600 ft.; Beaverhill Lake at 7,900 ft.; Swan Hills member of Beaverhill Lake at 8,050 ft. Note: These wells have 10-155 ft. of net pay in reef.

WATERTON PARK, Alberta.
Pay: Mississippian-Livingstone. Total depth 11,000 ft.
Rig time: 90% on footage rate. 10% on day-work rate. Total days 180. Total bits 160.
Casing: 13⅜-in. surface casing set at 1,100 ft. with 1,100 sacks of cement. 7-in oil string at 10,400 ft. with 1,400 sacks of cement.
Mud: Low-solids lime mud. Material used varies with lost-circulation problems.
Tops: Cardium at 4,400 ft.; Mississippian at 10,000 ft.; Mississippian-Livingstone at 10,350 ft.

FORT NELSON, British Columbia.
Pay: Mississippian at 2,000 ft.; Slave Point (Middle Devonian) at 6,600 ft. Total depth 7,000 ft.
Costs: Flowing well $230,000. Dry hole $150,000. Footage price $8.25. Day-work rate with pipe $1,200, and without pipe $1,150.
Rig time: 67% on footage rate. 33% on day-work rate. Total days 45. Total bits 35.
Casing: 13⅜-in. surface casing set at 620 ft. with 450 sacks of cement. 7-in. oil string at 6,550 ft. with 1,040 sacks of cement.
Mud: Gel, 56,500 lb.; caustic, 1,625 lb.; lime, 50 lb.; redwood bark, 3 sacks; sawdust, 120 sacks; quebracho, 1,250 lb.; thinners, 1,070 lb. CMC, 250 lb.
Tops: Mississippian at 2,000 ft.; Slave Point at 6,600 ft.

OFFSHORE LAKE ERIE, Ontario.
Pay: Guelph. Total depth 1,400 ft.
Costs: Flowing well $35,000. Dry hole $32,000. Footage price $20-25. Day-work rate without pipe $625.
Rig time: 80% on footage rate. 20% on day-work rate. Total days 30.
Casing: 10¾-in surface casing set at 200 ft. with drive pipe, 8⅝-in. intermediate at 300 ft. with casing shoe. 7-in. oil string at 1,200 ft. with 180 sacks of cement. Remarks: Mostly cable-tool drilling.
Tops: Dundee at 200 ft.; Bass Island at 600 ft.; Guelph at 1,200 ft.

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Bethlehem stocks at the Sparrows Point, Md., Plant, all of the flanged and dished heads listed here. Available in ASTM Spec. A-285, Grade C Flange or Firebox steel, they meet every requirement of the ASME Code for boilers and unfired pressure vessels.

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24	3/16	24	1 1/2	2	41
24	1/4	24	1 1/2	2	54
24	5/16	18	1 1/2	2	67
24	3/8	18	1 1/2	2	79
30	3/16	30	1 7/8	2	60
30	1/4	24	1 7/8	2	80
30	5/16	24	1 7/8	2	98
30	3/8	24	1 7/8	2	117
36	3/16	36	2 1/4	2	84
36	1/4	30	2 1/4	2	111
36	5/16	30	2 1/4	2	137
36	3/8	30	2 1/4	2	163
36	1/2	30	2 1/4	2	216
42	1/4	36	2 5/8	2	148
42	5/16	36	2 5/8	2	183
42	3/8	36	2 5/8	2	217
42	7/16	36	2 5/8	2	252
42	1/2	36	2 5/8	2	286
48	1/4	42	2 7/8	2	190
48	5/16	42	2 7/8	2	234
48	3/8	42	2 7/8	2	278
48	7/16	42	2 7/8	2	322
48	1/2	42	2 7/8	2	366
54	3/8	48	3 1/4	2	350
54	1/2	48	3 1/4	2	459
60	3/8	54	3 5/8	2	427
60	1/2	54	3 5/8	2	560
72	5/16	66	4 3/8	2	515
72	1/2	66	4 3/8	2	795
84	3/8	78	5 1/8	2	828
96	5/16	90	5 7/8	2	933
96	3/8	90	5 7/8	2	1095
96	1/2	90	5 7/8	2	1428

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Drilling contractors still folding up

. . . but at a much slower pace than the previous 2 years. New Journal census shows only 3% fewer rotary-drilling contractors in U. S. this year. The giant contractors continue to take on more rigs. They now own more than 18% of the total.

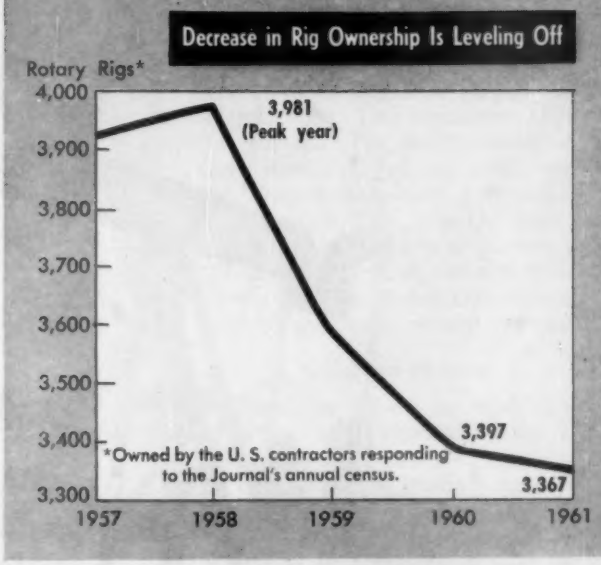
BY ROBERT BIZAL
Editorial Research

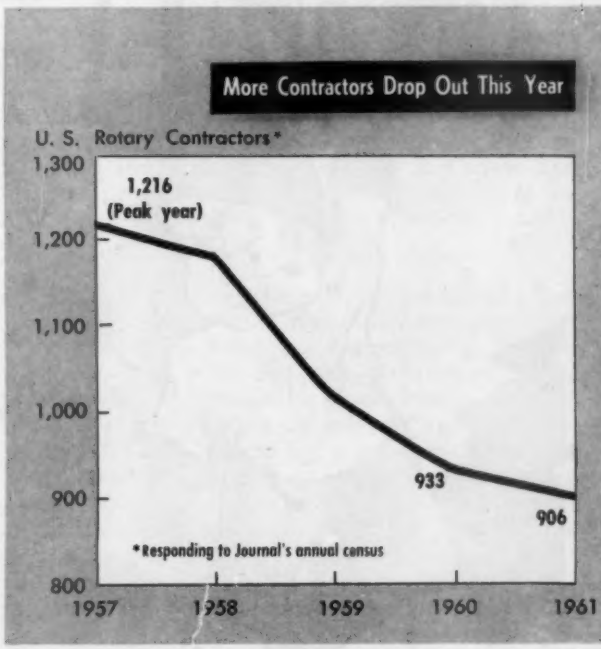
CONTRACTORS have been going out of business at a fast clip during the past few years, following the pattern of decreased drilling activity in the U. S.

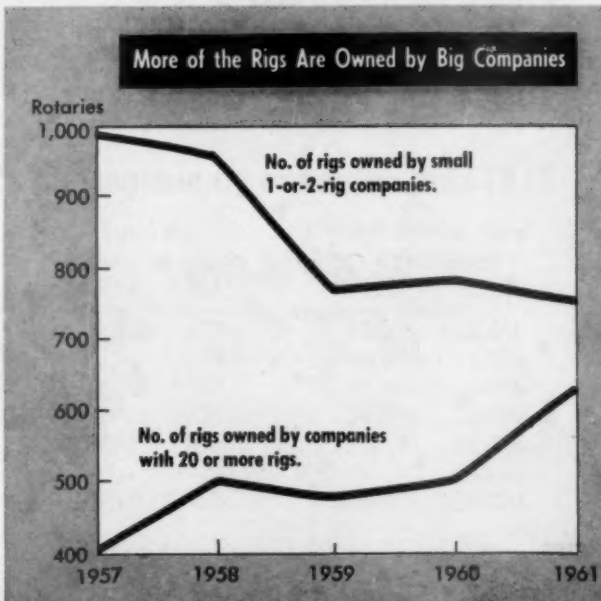
But the trend is not so pronounced this year.

The Oil and Gas Journal's annual census this year shows 906 rotary-drilling contracting firms in the U. S., compared with 933 last year, 1,018 the year before, and 1,216 during the peak year of 1957.

The 906 contractors currently doing business re-







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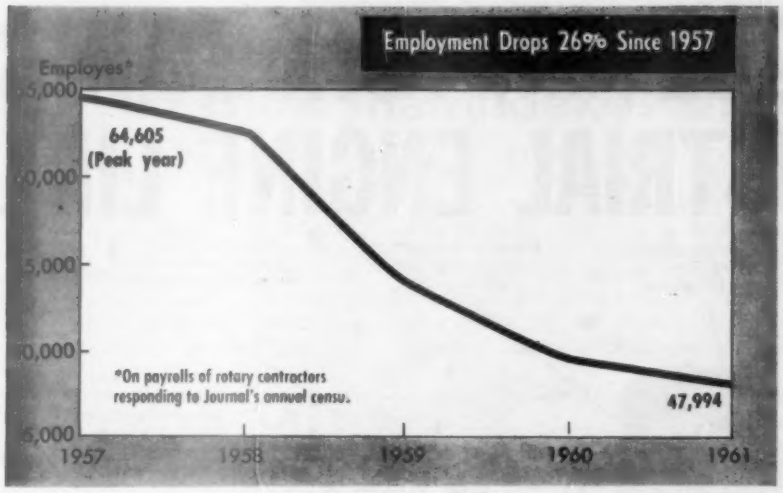

ported they own 3,367 rotary rigs, compared with 933 firms owning 3,397 last year. The peak rig ownership year was 1958, when 1,187 firms owned 3,981 rotaries.

The Journal's new rig count does not include cable tools, nor does it include rigs owned and operated by producing companies.

Big Companies Gain

As the little contractors go out of business, the giant drilling firms have been increasing in number and in rig ownership.

The new survey shows 17 contractors with 20 or more rigs each. Last year there were only 13 firms in this category.

These 17 big contractors now own a total of 627 rigs, or about 18½% of the total. Last year, the 13 big companies owned only 501 rigs, or about 14½% of the total rig ownership.

While this trend toward more of the big companies has been going on, the smaller firms with only one to five rigs have had a high drop-out rate.

There are now 772 firms in this category and they own a total of 1,746 rigs. In comparison, in 1957 there were 1,069 such companies with ownership of 2,368 rigs.

Employment Dips

The peak year for employment in the rotary-drilling business was back in 1957 when the 1,216 companies answering the Journal survey had 64,605 employes on the payroll.

This plunged steadily. By 1960 employment had sunk to 49,446. The 906 companies this year reported only 47,994 employes.

The peak year for employment of superintendents and tool pushers was 1957, when there were 3,438 on the contractors' payrolls. By 1960 this had dropped to 2,448.

But in 1961, the number of superintendents and tool pushers rose again, this time to 2,533.

The greatest concentration of superintendents and tool pushers on operating rigs is in Texas. The 1961 census shows 887 were on location in that state. This represents 35% of the total. The Rocky Mountain area had 16% of the total, and Louisiana had the same percentage.

Tulsa is still the principal mecca for big drilling firms, headquartering 47 companies owning 488 rigs. Next comes the Fort Worth-Dallas area, with 62 companies owning 294 rigs.

Canadian Picture

There has been no significant change in the Canadian picture in the past year.

The new census shows 52 rotary-drilling contractors with 316 rigs, compared with 56 contractors with 320 rigs last year. Control point for most of the contractors is Calgary. In 1958, there were 82 Canadian contractors with ownership of 333 rotaries.

The U. S. census shows that 33 of the U. S. companies have an additional 60 rigs in Canada and 246 in foreign service, either directly or under subsidiary firms.

Drilling Activity

Rotary drilling got off to a bad start in 1961. There were only 1,479 rotary rigs running in the U. S. in the first part of February, lowest level since March 1946.

But by midyear, rotary activity picked up, surpassing the level of activity at midyear 1960. This stepped-up tempo boosted the cumulative average for 1961 to 1,709 active rotaries as of September 11. This is only slightly lower than the 1,730 for the same period last year.

Well completions in the U. S. this year, as of September 16, totaled 32,657, slightly higher than the 32,108 reported for the like period last year. This includes completions by cable tools as well as rotaries.

Sizes of U. S. rotary-contracting companies and changes in rig ownership since 1957

Sizes of companies	No. of contractors in each category 1957	1961	Total rigs owned by group 1957	1961	Per cent of total rigs owned 1957	1961
20 or more rigs	12	17	405	627	10.3%	18.6%
10 to 19 rigs	38	28	474	377	12.0%	11.2%
6 to 9 rigs	100	89	690	617	17.5%	18.3%
3 to 5 rigs	372	266	1,370	988	34.8%	29.4%
1 or 2 rigs	697	506	998	758	25.4%	22.5%
Totals	1,219	906	3,937	3,367	100.0%	100.0%

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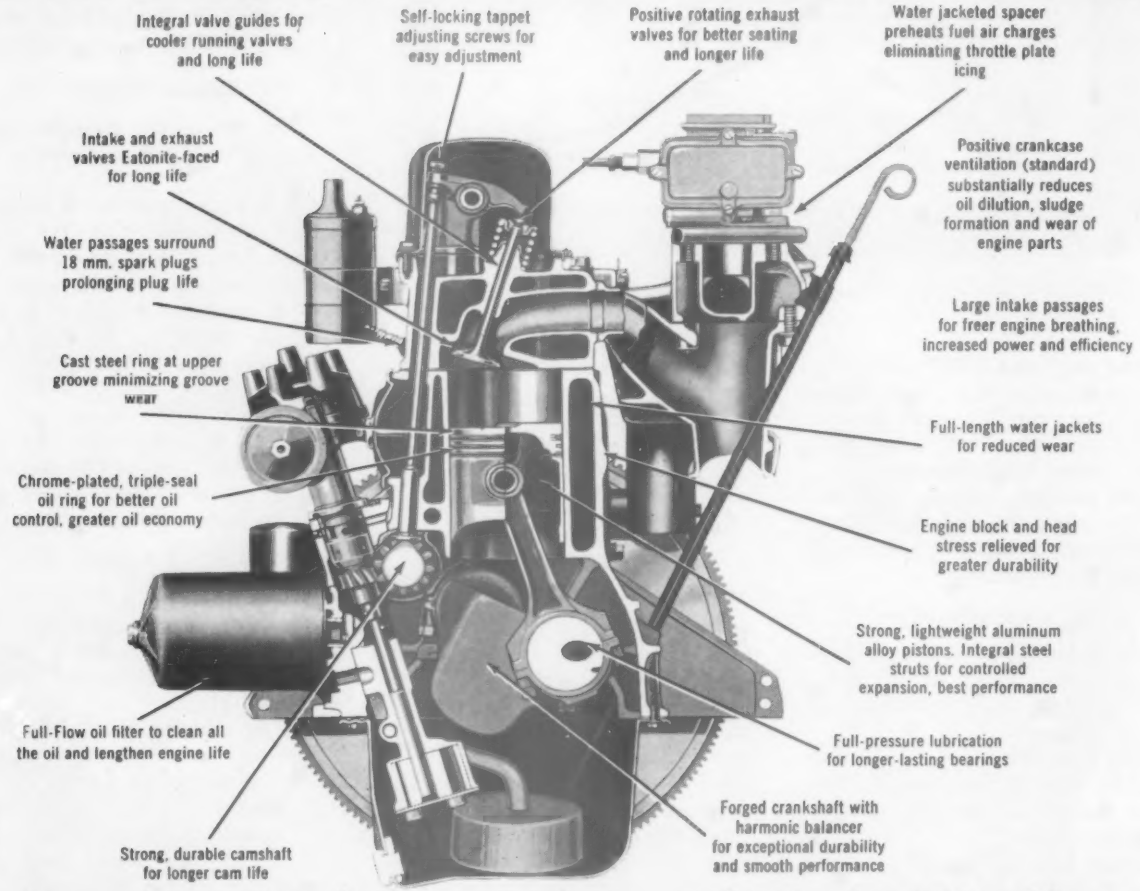
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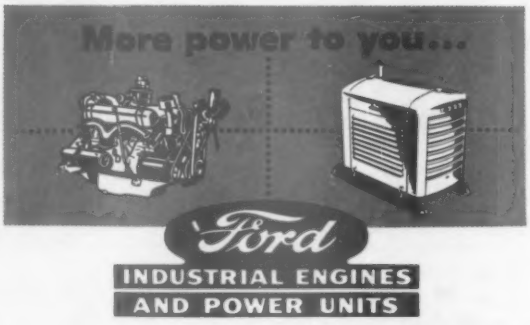

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Do you know that indexes show real prices?

BY W. L. NELSON
Technical Editor and Petroleum Consultant

MANY of our readers fail to realize that the Itemized Cost Indexes shown on this page are based on real prices or costs, and that they can be used to obtain current prices and costs. Itemized Cost Indexes is published each quarter so that the mass of costs and prices published in the Costimating and Process Costimating series, and any other sources, can be kept up to date. Some of the basic prices (or costs) of items published quarterly in the Itemized Cost Indexes tabulation are shown in Table 1. Specific prices could not be stated for some of the indexes because they are composites. Thus. the index for exchangers represents four different equipments.

TABLE 1—BASIC PRICES OF SOME ITEMS OF THE ITEMIZED COST INDEXES TABULATION.

	Basic prices* 1946 or 1956†	May 1961 prices*		Basic prices* 1946 or 1956†	May 1961 prices*
Power, electrical	†1.196 ct./kw.-hr.	†1.263	Instrument—PR (pneu.)	$216	$ 450
Fuel, Gulf cargoes	†$2.14/bbl.	†$2.16	PR (electrical)	300	737
Fuel, N. Y. barges	†$2.76/bbl.	†$2.54	PRC (pneu.)	500	1,015
Fuel, S. Pedro bunkers	†$2.16/bbl.	†$2.22	PRC (elect.)	590	1,423
Fuel, Okla. (to North)	†$2.03/bbl.	†$1.75	PRC (standard)	225	465
Natural gas (wellhead)	†10.9 ct./M.c.f.	†16.21	Pressure gage	19.80	23.60
Acid, hydrofluoric	†17.9 ct./lb.	†18.00	Flowmeter (mech.)	178	404
Acid, phosphoric	† 5.4 ct./lb.	† 5.6	Flowmeter (pneu.)	215	487.50
Acid, sulfuric	†$22.35/ton	†$22.35	Flowmeter (elect.)	390	955
Ammonia	†$85.00/ton	†$94.50	FRC (air)	306.50	709
Lime	†$12.70/ton	†$13.85	FRC (remote)	410	739
Sod. carbonate	†1.49 ct./lb.	†1.55	FRC (pneu.)	540	1,094.50
Sod. hydroxide	†2.59 ct./lb.	†3.00	FRC (elect.)	670	1,609
Sod. phosphate	†7.8 ct./lb.	†7.9	TR (pneu.)	230	443.05
Furfural	†12 ct./lb.	†11.5	TR (elect.)	350	849
Methylethyl ketone	†14.5 ct./lb.	†15.0	Potentionmeter 6-pt.	640	1,540
Platinum	†$102.00/oz.	†$82.00	Potentiometer (air)	469	1,160
Phenol	†15.5 ct./lb.	†15.3	TRC (thermometer)	344	639.75
TEL	†2.179 ct./ml.	†2.129	TRC (pneu.)	555	1,050.05
Wages—operating	†$108.39/wk.	†$128.84	TRC (elect.)	620	1,503
Wages—skilled const.	$1.80/hr.	$4.163	Valve (pneu.)	144	287
Wages—common	$1.033/hr.	$2.815	Valve (elect.)	238	474
Wages—ref. const.	$1.46/hr.	$3.669	Redwood, heart	60.50 M.f.b.m.	112.09
Brick—building	$17.20/M.	$28.999	Cypress, C select	71.50 M.f.b.m.	190.71
			Pipe—sewer	32.44 ct./ft.	58.3
			Pipe—black iron ¾-in.	7.55/100 ft.	19.495
			Pipe—6 in. line	79.34/100 ft.	195.43
			Tube—seamless carbon	18.11/100 ft.	51.20

*Prices or costs. The basic prices (1946 or 1956) are sometimes only the equivalent price (or cost) of the material or service now listed.
†Indicates prices based on 1956.

Itemized Cost Indexes

	1950	1954	1958	1959	1960	May 1961	References*	Index for earlier years (The Oil and Gas Journal) in Costimating and Questions on Tech. issues
Operating costs (based on 1956 as 100.0):								
Power, electrical, industrial	97.3	98.5	102.8	103.2	104.8	105.4	Code 541-03	No. 13, May 19, 1958
Fuel, refinery	70.3	86.5	102.1	103.5	109.9	113.2		No. 4, Mar. 17, 1958
Gulf cargoes	78.0	85.9	102.9	93.5	101.8	100.9		No. 4, Mar. 17, 1958
N. Y. barges	76.9	82.6	93.0	85.9	91.2	92.0		No. 4, Mar. 17, 1958
S. Pedro bunkers	65.8	84.3	114.6	99.5	98.2	102.7		No. 4, Mar. 17, 1958
Oklahoma, northern shipments	77.7	62.0	66.3	78.8	83.7	86.2		No. 4, Mar. 17, 1958
Natural gas at wellhead	60.2	93.5	118.3	130.3	142.4	148.8	Code 531-01	No. 4, Mar. 17, 1958
Industrial chemicals	83.3	96.9	101.8	102.1	102.1	101.4	Code 61	No. 58, Oct. 12, 1959
Acid, phosphoric	86.7	96.6	103.4	103.4	103.4	103.4	Code 611-07	No. 58, Oct. 12, 1959
Acid, sulfuric	80.8	100.0	100.0	100.0	100.0	100.0	Code 611-09	No. 58, Oct. 12, 1959
Ammonia	104.8	103.0	103.8	105.1	108.1	111.3	Code 611-13	No. 58, Oct. 12, 1959
Lime	64.6	92.0	104.4	106.1	108.5	109.2	Code 611-29	No. 58, Oct. 12, 1959
Sodium carbonate	75.5	92.9	104.3	104.3	104.3	104.3	Code 611-65	No. 58, Oct. 12, 1959
Sodium hydroxide	76.3	90.9	112.6	115.7	115.7	115.7	Code 611-69	No. 58, Oct. 12, 1959
Sodium phosphate	87.5	95.5	104.6	104.6	104.0	101.2	Code 611-71	No. 58, Oct. 12, 1959
Furfural	79.0	100.0	100.0	100.0	98.6	95.8	Code 612-63	No. 58, Oct. 12, 1959
MEK, drums	80.0	94.5	106.9	103.3	103.3	103.3	Ch. & E. News	No. 58, Oct. 12, 1959
Platinum	101.5	82.6	63.7	71.8	80.0	80.4	Code 1022-30	
Phenol	81.3	90.4	102.7	96.8	95.2	98.4	Code 612-83	No. 58, Oct. 12, 1959
TEL	94.1	102.8	99.9	100.7	97.7	97.7	Supplier	No. 58, Oct. 12, 1959

(Continued on next page)

Itemized Cost Indexes (continued)

	1950	1954	1958	1959	1960	May 1961	References*	Index for earlier years (The Oil and Gas Journal) in Costimating and Questions on Tech. issues
Operating labor (wages)	72.0	88.7	105.4	111.5	113.0	118.7	Employ. & Earn.	No. 41, Feb. 16, 1959
Productivity	85.5	97.1	100.3	109.0	112.9	116.7	Employ. & Earn.	No. 41, Feb. 16, 1959
Construction wages (1946 = 100):								
Skilled construction	140.0	174.6	205.1	214.6	223.5	231.3	Eng. News Record	No. 55, Nov. 3, 1949
Common labor	148.1	192.1	235.7	248.6	261.1	272.5	Eng. News Record	No. 55, Nov. 3, 1949
Refinery construction	144.0	183.3	220.4	231.6	241.9	247.8		No. 61, Dec. 15, 1949
Equipment or material (1946 = 100):								
Arc-welding machinery	....	158.4	193.2	192.1	199.6	193.5	Code 1176	May 2, 1955†
Boilers, tanks and sheet metal	136.0	147.3	175.1	177.2	181.0	179.8	Code 1072	No. 5, Nov. 18, 1949
Building materials (nonmetallic)	127.0	143.6	161.7	163.5	164.0	164.6	Code 13	No. 61, Dec. 15, 1949
Brick—building	132.5	144.7	162.4	166.4	169.2	168.6	Code 1341	No. 20, Mar. 3, 1949
Brick—fireclay	153.4	193.1	238.7	244.4	244.4	241.5	Code 1342	May 30, 1955†
Castings (foundry products)	152.9	181.1	227.2	231.6	233.3	233.7	Code 1015	No. 46, Sept. 1, 1949
Clay products (structural, etc.)	134.6	159.1	187.0	191.4	193.0	192.6	Code 134	No. 20, Mar. 3, 1949
Concrete ingredients	125.3	142.1	163.2	164.7	167.8	167.4	Code 132	No. 22, Mar. 17, 1949
Concrete products	124.4	138.5	151.0	152.9	154.6	154.8	Code 133	
Electrical machinery	134.9	159.9	192.7	195.8	195.2	189.9	Code 117	May 2, 1955†
Motors and generators	135.0	157.7	186.4	186.4	182.8	177.1	Code 1173	No. 31, May 19, 1949
Switch gear	....	171.2	218.8	223.5	221.0	220.6	Code 1175	May 2, 1955†
Transformers	131.6	161.9	187.3	188.6	181.8	158.0	Code 1174	No. 31, May 19, 1949
Engines (composite)	126.0	150.5	178.3	178.5	180.7	180.9	Code 1154	No. 36, June 23, 1949
Exchangers	140.0	171.7	181.2	179.3	194.0	186.3	Manufacturer	No. 2, Oct. 28, 1948
Copper base	....	190.7	168.8	169.6	184.9	177.8	Manufacturer	
Steel	....	156.8	190.0	186.4	201.2	193.0	Manufacturer	
Fans and blowers	162.9	192.6	241.7	244.4	244.0	243.2	Code 1147	Feb. 17, 1949†
Hand tools	143.2	173.8	224.7	230.4	234.5	237.8	Code 1042	June 27, 1955†
Instruments (composite)	127.8	154.6	194.9	201.0	202.5	207.5	Manufacturer	No. 34, June 9, 1949
Pressure recorder (pneu.), PR	137.9	168.0	204.0	204.0	206.3	208.3	Manufacturer	No. 34, June 9, 1949
Pressure recorder (elect.), PR	137.0	162.8	229.5	246.6	243.0	245.7	Manufacturer	No. 34, June 9, 1949
Pressure recorder cont. (pneu.), PRC	134.0	163.5	198.8	198.7	201.7	203.0	Manufacturer	No. 34, June 9, 1949
Pressure cont. (elect.), PRC	135.0	160.2	225.7	242.8	239.2	241.9	Manufacturer	No. 34, June 9, 1949
Pressure recorder cont. (stand.), PRC	135.6	166.3	200.0	200.0	204.7	207.1	Manufacturer	No. 34, June 9, 1949
Pressure gage only, PI	101.2	108.6	119.2	119.2	119.2	119.2	Manufacturer	No. 34, June 9, 1949
Flowmeter (mech.), FR	114.0	161.6	209.9	219.1	221.0	227.0	Manufacturer	No. 34, June 9, 1949
Flowmeter (pneu.), FR	113.8	161.4	209.6	218.8	220.7	226.7	Manufacturer	No. 34, June 9, 1949
Flowmeter (elect.), FR	136.8	162.3	228.5	245.6	242.0	244.9	Manufacturer	No. 34, June 9, 1949
Flow control (air), FRC	138.5	179.6	216.3	223.5	228.7	231.3	Manufacturer	No. 34, June 9, 1949
Flow control (remote), FRC	135.5	146.5	176.4	178.1	178.5	180.3	Manufacturer	No. 34, June 9, 1949
Flow control (pneu), FRC	131.1	160.3	194.3	198.0	200.8	202.7	Manufacturer	No. 34, June 9, 1949
Flow control (elect.), FRC	134.0	159.1	224.1	241.1	237.4	240.1	Manufacturer	No. 34, June 9, 1949
Temp. recorder (pneu.), TR	128.3	157.3	188.1	188.1	190.6	192.6	Manufacturer	No. 34, June 9, 1949
Temp. recorder (elect.), TR	135.5	160.8	226.4	243.5	239.9	242.6	Manufacturer	No. 34, June 9, 1949
Potentiometer, 6-point, TR	134.0	167.2	240.4	258.9	240.9	240.8	Manufacturer	No. 34, June 9, 1949
Potentiometer (air con.), TRC	134.1	150.5	212.6	231.6	242.4	247.8	Manufacturer	No. 34, June 9, 1949
Thermometer cont., TRC	124.0	152.8	179.7	179.7	183.9	186.0	Manufacturer	No. 34, June 9, 1949
Temp. control (pneu), TRC	126.2	154.7	184.9	184.9	187.1	189.2	Manufacturer	No. 34, June 9, 1949
Temp. control (elect.), TRC	135.4	160.7	226.2	243.3	239.7	242.4	Manufacturer	No. 34, June 9, 1949
Control valve (pneu.)	133.3	162.0	199.3	199.3	199.3	199.3	Manufacturer	No. 34, June 9, 1949
Control valve (elect.)	133.3	161.9	199.2	199.2	199.2	199.2	Manufacturer	No. 34, June 9, 1949
Insulation (composite)	....	198.5	188.0	186.8	188.5	188.5	Manufacturer	
Lumber (composite)	193.0	197.8	198.9	214.1	204.8	197.6	Code 81	No. 7, Dec. 2, 1948
Southern Pine	176.9	181.2	184.7	190.9	187.9	180.5	Code 812	No. 7, Dec. 2, 1948
Redwood, all heart	212.0	238.0	204.0	218.5	211.4	185.2	Code 813-31	
Cypress, C select	250.0	253.0	266.5	267.5	267.4	266.9	Code 813-41	
Machinery:								
General purpose	136.7	159.9	199.6	206.0	208.4	207.4	Code 114	Feb. 17, 1949†
Construction	140.1	165.9	209.6	217.0	221.8	225.2	Code 112	
Oil field	135.8	161.9	192.5	192.6	193.0	195.1	Code 1151	Oct. 10, 1955†
Paints—prepared	140.0	159.0	180.9	179.9	181.2	186.3	Code 621	May 16, 1955†
Pipe:								
Sewer	120.7	140.1	170.1	176.2	178.2	179.7	Code 1345	No. 22, Mar. 17, 1949
Black iron	160.0	195.0	264.8	263.8	261.0	258.2	Code 1014-56	No. 42, Aug. 4, 1949
6-in. line	‡156.5	‡182.7	‡252.4	‡251.5	248.9	246.3	Code 1014-58	
Pumps, air compressors, etc.	138.2	166.5	214.7	226.5	228.3	229.4	Code 1141	No. 29, May 5, 1949
Steel (iron and steel)	152.9	179.6	228.2	232.4	229.7	229.9	Code 101	No. 61, Dec. 15, 1949
Steel—finished steel	153.7	187.1	240.6	244.7	244.0	243.6	Code 1014	July 25, 1955†
Plate	....	187.0	252.7	257.4	254.3	254.3	Code 1014-26	No. 5, Nov. 18, 1949
Structural shapes	162.7	193.4	262.8	268.5	268.3	268.3	Code 1014-31	No. 18, Feb. 17, 1949
Seamless tubes, 2-2¼ in.	149.5	199.4	277.5	285.1	282.7	282.7	Code 1014-61	Sept. 5, 1955†
Valves and fittings	135.8	197.1	242.7	257.6	260.3	251.9	Code 1149 (10 items)	No. 46, Sept. 1, 1949
Nelson Refinery Construction (1946)	146.2	179.8	213.9	222.1	228.2	231.7		No. 61, Dec. 15, 1949
Nelson Refinery Operation (1956)	72.4	88.7	105.8	106.8	108.8	108.9		No. 2, Mar. 3, 1958
Nelson Refinery Process Operation (1956)	75.1	88.4	105.8	106.0	107.2	109.1		No. 2, Mar. 3, 1958

*Code refers to the index code number of the Bureau of Labor Statistics, U. S. Department of Labor, "Wholesale Prices." †Questions on Technology, The Oil and Gas Journal. ‡Revised.

FLY UNITED JETS TO THE AMERICAN PETROLEUM INSTITUTE CONVENTION

CHICAGO, NOVEMBER 13-15

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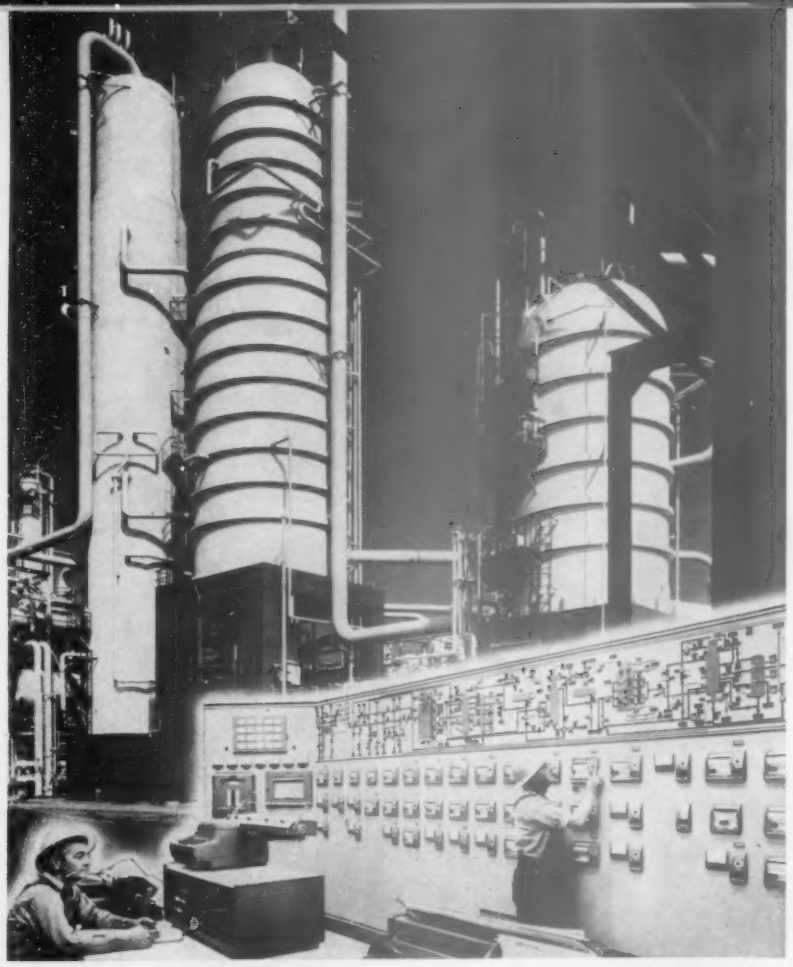


COMPUTER CONTROL SYSTEM (inset), incorporated in the original design of DX Sunray's new refinery units, measures pressures, temperature, and rates of flow from 191 points in the unit and 30 instruments are automatically reset.

New crude unit is designed for computer control

A NEW 85,000-bbl.-daily crude-oil distillation unit, the nation's first to incorporate a computer control system in its original design, has been placed on stream at the DX Sunray Oil Co.'s Tulsa refinery.

The multimillion-dollar crude unit replaces five older units which had a combined capacity of 75,000 bbl. a day.

The new three-stage distillation unit is the eighth major refinery unit completed at the plant since a major expansion and modernization program started in 1958.

The new computer-control system continuously scans 191 process instruments to detect abnormal conditions and can automatically reset 30 control instruments.

Temperature, pressure, rate of flow, and other measurements recieved by the computer are stored and compared to preset limits. Deviations are signaled to the operator.

Prime object of the system is to provide more precise control of processing and separation of crude-oil components, thus realizing maximum operating efficiency. In addition, substantial savings in operating costs and maintenance are expected.

The unit produces straightrun gasoline, naphtha, kerosine, heating oils, lubricating-oil and wax-base stocks, fuel oil, asphalts, and cracking stocks.

Equipment. The complete system consists of a RW-300 computer console, two analog input cabinets, two Flexowriter units, three logging typewriters, a logging-typewriter desk, and the operator's control console and panel.

The computer includes an arithmetic and control unit which will perform all arithmetic operations from either prestored instructions or from instructions given manually by an operator.

A data-conversion unit periodically samples portions of the computer's memory and converts the information from digital to analog form for measuring instruments, and converts data received from analog to digital form and stores the results in the computer memory. The system can measure up to 244 process variables.

Operation. Periodically certain of the process variables are scanned to see that they do not exceed set limits or that their deviation from a controlled set point does not exceed a prescribed amount. When a variable is discovered outside such limits, a warning is typed in red on the Flexowriter. Certain of the process variables, or functions of the variables are recorded by the logging typewriters every 2 hours and daily.

From a special control panel, by means of push buttons and indicators, the operator can demand logs and summary statements of out-of-limit variables or faulty instruments. The operator can also request the computer read new information from digit switches into memory.

The computer scans all input variables every 10 minutes. As each variable is read, it is checked to determine that the instrument measuring the variable is providing a reasonable reading.

The most modern stream analyzers are installed in the unit to feed information into the machine. Included are instruments for continuously measuring the viscosity of lubricating-oil base stocks, for measuring a selected boiling point of side streams, for measuring oxygen to compute furnace efficiency, for measuring the gravity or nature of crude oil coming into the unit, and for measuring gases separated from the crude oil.

Jet cleaning halves down time of waste-water filter drums

FILTER-DRUM precoat is removed in short order by jets of hot water forced at high pressure through a specially designed system of manifold nozzles.

A HYDRAULIC-JET cleaning system has enabled Atlantic Refining Co. to reduce down time of vacuum-filter drums in the waste-water treatment plant of its Philadelphia refinery. Removal of residual precoat from the drums is now accomplished in half the time required before.

Atlantic processes 80 to 100 tons of flocculation sludge per day in the waste-water treatment plant. Filtrate from the sludge is returned to the plant for further treatment.

Four large vacuum-filter drums, each 10 ft. in diameter and 18 ft. long, are used to pull the filtrate from the sludge. Knives, extending the length of the drums, continuously cut off the filter cake. Conveyor belts carry the filter cake to an incinerator-boiler where it is used in generating 150-psi. steam.

After 2 or 3 days' use, residual precoat must be removed from the drums before new precoat is applied. In the past this was done by sluicing with low-pressure water—a relatively inefficient method. Two to four hours were required for complete removal.

To reduce down time and increase plant capacity, Atlantic engineers designed a system of manifold nozzles that force hot water under high pressure against the precoat to remove it from the drum. With this method precoat is removed and screen is cleaned in 1 to 2 hours.

Heart of the system is a unique hydraulic jet-feed unit that combines plant inlet steam and cold water to form a powerful jet discharge stream which is fed to the manifold nozzles at a pressure two to four times higher than inlet steam pressure. This high discharge pressure produces the high cleaning impact needed for hydraulic scrubbing action. Temperature of the stream averages 190° F.

When required, the scrubbing action of the nozzles is supplemented by hand-held lance which directs high-pressure jets against the drum to speed removal of the residual precoat.

Operation of the unit, made by Sellers Injector Corp., is simple. Only two valves, water and steam, need to be turned to start the unit. After that, no further attention is required. Since the hydraulic jet has no moving parts, maintenance is negligible.

New fuel does better job in flame cutting

A NEW FUEL designed to replace acetylene has demonstrated its advantages over other fuels in extensive tests at Dow Chemical Co.'s Texas Division at Freeport, Tex. The new fuel, methyl acetylene propadiene propylene (MAPP) is produced by Dow at Midland, Mich.

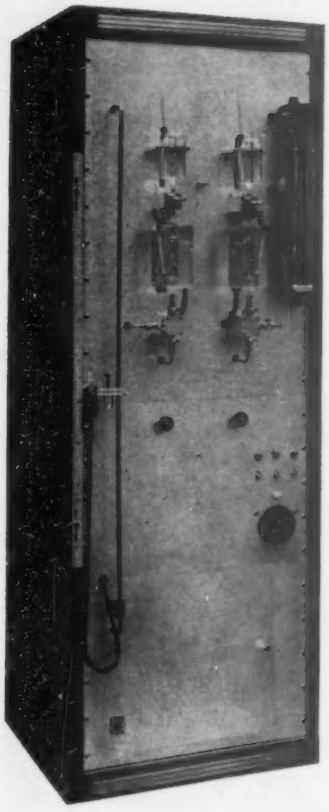
The new fuel is packaged safely in standard LPG cylinders (photo) and can be shipped in tank-car quantities.

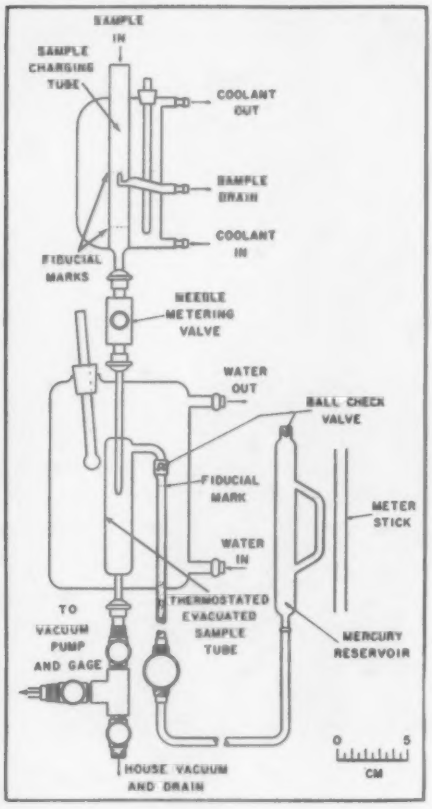
The Freeport tests show that the fuel is equal to acetylene for brazing, soldering, piercing, metalizing, and cutting but can do the same job about 20% cheaper.

Dow says the new fuel gives a cleaner, more economical cut on 1-in. or thicker plate than either acetylene or natural gas. All gases performed about the same on plates less than 1 in. thick.

It is safer to handle than acetylene, Dow says. At normal temperatures and pressures (60 to 100 psi.) the fuel is far below its critical pressure. Acetylene is limited to about 15 psi. pressure for safe use.

Dow says it has many advantages for shop use: It will reduce oxygen consumption, cut fuel-gas consumption, eliminate cylinder handling inside the shop, remove a hazardous material from the shops, and permit smaller manifold lines because of the higher pressures.





Dual-head microvapor-pressure apparatus gets

Faster, more accurate R.v.p. measurements

By T. J. PUZNIAK AND JAMES EPPOLITO
Gulf Research & Development Co.,
Pittsburgh

THE MICROVAPOR-PRESSURE method is a new way to correlatively measure Reid vapor pressure rapidly and accurately. It is able to do this by avoiding those sources of error which affect the precision of ASTM Reid. The method was developed by modifying an existing micromanometric apparatus.

Essential feature of this method is the charging by gravity of an air-saturated sample into an evacuated and thermostated tube via a simple but rugged charging head. The pressure exerted by the volatiles plus the air dissolved in the charge is measured directly in millimeters of mercury on an open-end mercury manometer, which is attached to the thermostated tube.

Reid vapor pressures measured by this new approach offer a number of advantages over ASTM Reid:

- Microvapor-pressure apparatus is simple to operate, of rugged construction, and requires only 2 minutes to clean in preparation for the next test.
- Time required per determination is 15 minutes, or a prorated time of 7.5 minutes with a dual piece of apparatus. ASTM Reid requires about 45 minutes for a determination when considering the actual test time, plus the time spent for cleaning the bomb components, and finally, equilibrating the air chamber to 100° F. in preparation for the next test.
- Sample volume required is 15 ml. compared to about 135 ml. for the Reid bomb.
- Reproducibility is 0.15 psi. compared to the stated ASTM reproducibility of 0.3 psi. In practice, ASTM reproducibility is nearer to 0.5 psi., although it can be reduced below 0.3 if certain laborious precautions are taken.

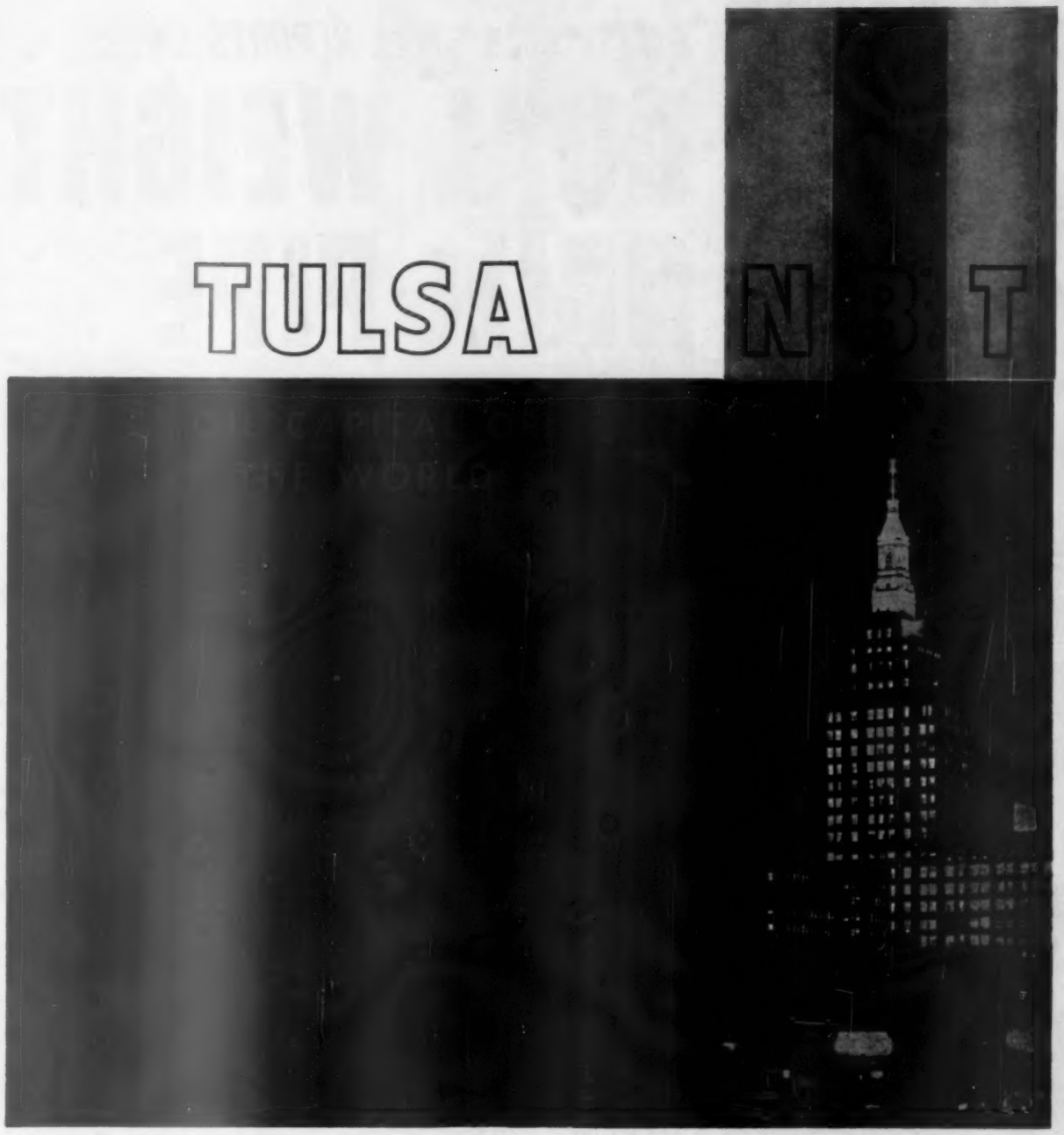
The apparatus developed is similar to one developed by Santora[2] except the ratio of the vapor space to liquid space to liquid volume in the evacuated tube is fixed at 4:1 as specified in the ASTM Reid method. It differs from the microvapor-pressure apparatus developed by Mottlau[3] in that no transfer of mercury is used to set the volume of the vapor space; nor are delicate, calibrated pipettes used to charge the sample into the system.

What's wrong with ASTM? A study of the ASTM Reid method showed four sources of error. In order of importance they are:

1. Contaminants remain in the test equipment from prior use. For a gasoline having an 11.1-psi. Reid vapor pressure, contamination can reduce its vapor pressure by as much as 3.8 psi.

2. Many times there are difficult-to-detect leaks in the apparatus. Reid bombs used in this study had O-ring gaskets for seals between the gasoline and air chamber, and between the gage adapter and air chamber. Vapors will leak from the bomb through any tool marks in the groove of this O-ring because the interior pressure (usually less than 15 psi.) may not be great enough to make the gasket assume the contour of these marks.

3. Air saturation of the gasoline at the end of the test varies. The gain in the amount of dissolved air at 100° F., calculated as an equivalent loss in vapor pressure, varies with each sample studied. This variation can account for differences in



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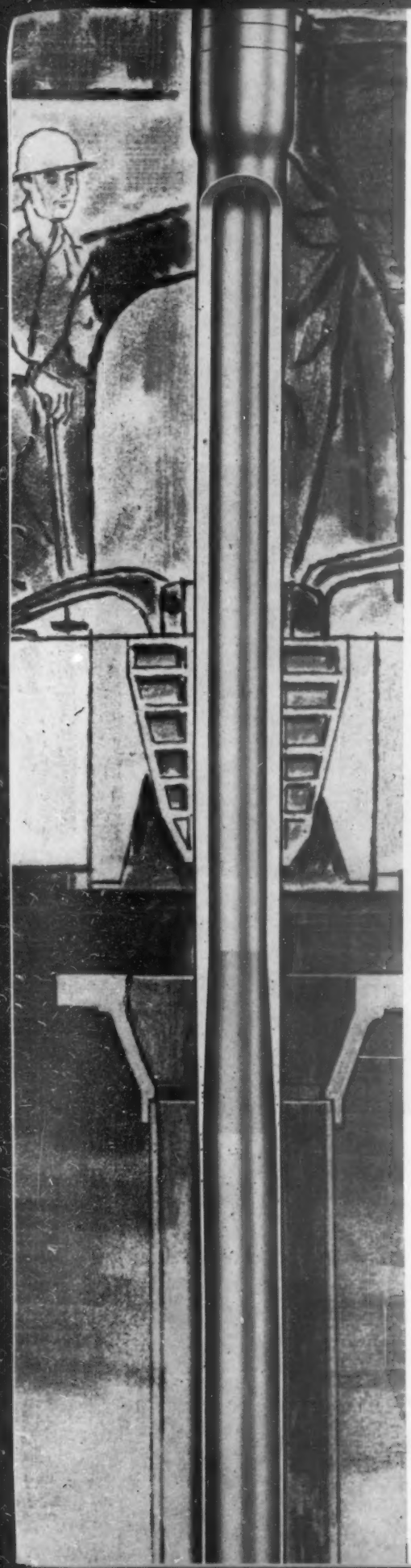

PITTSBURGH STEEL REPORTS ON...

DUAL WEIGHT DRILL PIPE

SUCCESS IN FIELD TEST

In West Texas, South Louisiana, Oklahoma and out on the West Coast, Pittsburgh Steel Company's new Dual Weight Drill Pipe is proving itself the way drillers best understand—by performance under actual field conditions.

Dual Weight is a completely new type of drill pipe developed and produced exclusively by the manufacturer of "Pittsburgh Seamless."

It provides drillers an integral combination of strength and light weight never before available in popular API grades and sizes of drill pipe.

Drilled footage on four strings of Dual Weight now stands at better than 100,000 feet—every inch of it under normal rotary drilling practices.

Results? Excellent—better than expected in some cases.

Field tests are continuing. Additional strings are being placed in service on drilling operations specifically selected to prove out Dual Weight's advantages and performance under the widest possible range of drilling conditions.

But, so far, here's what experience shows Dual Weight does:

- Cuts drill string weight.
- Increases rig depth capacity.
- Increases slip area strength up to 20 percent.
- Boosts hydraulic performance.
- Effects lower maintenance costs and longer service life on rig equipment.
- Cuts transportation costs.
- Increases drilling rates and speeds up round-trips.

• **What is Dual Weight?**—First of all, it's one of the most important developments in rotary drilling in many years. It's an entirely different type of drill pipe design—although it looks the same as other drill pipe. The difference is in the ID.

Look at the cutaway sketch at the left of this page. It shows Dual Weight's design features.

Notice the box end. Below the tool joint and upset, it has at least four feet (but not more than six feet) of heavy wall steel in the critical slip area. Then, a gradual, uniform internal taper makes transition to a light wall body that extends the remainder of the joint's length.

Some drillers refer to the heavy wall at the box end as a "long upset"—a good description, but inaccurate. The heavy wall is produced

by a patented process that bears no resemblance to upsetting.

Drillers can benefit two ways with Dual Weight.

If it's a lower hook load they want, then thin wall Dual Weight meets the need. It combines the strength of standard pipe in the slip area, and the weight saving of lighter weight pipe in the body.

Or, if extra strength and safety—rather than lower weight—are required, Dual Weight again is the answer. In this version, it has a standard wall body and an extra heavy box end with a safety factor

near or equal to the safety of the body.

• **Strength?**—Either way, Dual Weight has it—in the slip area where it's needed to resist the notching, crushing, crimping, stretching and bending forces it is subjected to.

Light weight? Its thinner wall body eliminates pounds per foot over 85 percent of the length of a 30-foot joint.

For example, 4½-inch Dual Weight with a .337/.254-inch wall weighs 16.60 lb./ft. for 15 percent of its length (the box end) and 13.25 lb./ft. for 85 percent of its length (the body).

And don't overlook hydraulic performance. The larger ID resulting from Dual Weight's thinner body wall lets pumps push more mud at lower pressures. There's more energy applied at the bit. Penetration rates are higher and returns are better.

But here's a sample of how drillers themselves benefit from Dual Weight.

A Large Independent Oil & Gas Drilling Corporation—drilling shallow wells in West Texas with 6,000 feet of 4-inch (.330/.254-inch wall) Grade E Dual Weight.

A Drilling Superintendent—"I believe Dual Weight is the only thing for a little rig. Its lighter weight means less wear and tear on the rig and equipment. And when you move as often as we do, there's quite a saving on trucking charges. Any time we can get away from handling weight, we're better off."

A Veteran Tool Pusher—"We save trip time because we can come out of the hole faster. With less weight we get more rpm's. We save fuel, too, because our engine isn't working as hard."

• A major oil company, drilling deep wells in Louisiana with 15,000 feet of 4½-inch, (.337/.271-inch wall) Grade E and P-95 Dual Weight.

A company drilling engineer said: "We're looking for higher velocities and larger volumes of fluid at equal pump pressures from Dual Weight. We know we're getting better hydraulics—moving more fluid.

"In deep drilling with high mud weights, you get better penetration with increased bit hydraulic horsepower. We calculate we're getting a 25 percent increase in BHP."

Interested in more detailed information? Write for literature, or contact a Pittsburgh Steel district sales office or one of the independent distributors listed below.

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Reid vapor pressures of as much as 0.1 psi.

4. Gage readings are not reproducible. Our study showed that for 42 determinations, or 25% of all measurements observed, an error of 0.10 psi. or greater in Reid vapor pressure could be attributed to gage error.

Modified Reid procedure. The ASTM procedure was modified to try to eliminate the sources of error in Reid method. However, the altered procedure was kept within the scope of the ASTM method. Most significant revisions were the improved safeguards against surface contamination of the apparaus components, and the manner of observing for leaks.

Errors due to differences in degree of air saturation at end of the test and to inherent gage errors cannot be eliminated. It was assumed that these were random errors and that their net influence was their algebraic sum.

Reproducibility of this revised procedure was 0.20 psi., compared to 0.25 for the ASTM method. This is a net gain of only 0.05 psi., even though elaborate, time-consuming precautions were taken. The revised method did, however, reduce the probability of an erroneous result.

Dual-Head M.v.p. Apparatus

Better Reid-vapor-pressure measurements can be made by avoiding the errors of the Reid method. By modifying an existing micromanometric apparatus, we were able to develop such a method.

A schematic drawing of the apparatus is shown. The valve between the charging head and evacuated tube is a stainless, packless needle metering valve. Valves at the exit of the evacuated tube and in the mercury line are of the stainless, packless type with Teflon seats and plungers.

Glass-to-metal connections were made with modified spherical joints having O-ring seats. The inner joints supporting the O-rings were machined from stainless-steel tubing and were soldered into the valves. They were then connected to the outer glass joints with pinch clamps.

A photograph of the complete apparatus is shown. Manufacturers Engineering & Equipment Co., Hatboro, Pa., intends to market a commercial model patterned after this.

R.v.p. correlation. An independent correlation for each head was developed between micro and Reid vapor pressure. Designating the head on the left in photo as A and the one on the right as B, the correlations were:

For head A: R.v.p. = 0.01899 M.v.p. — 0.65.

For head B: R.v.p. = 0.01901 M.v.p. — 0.67.

Average: R.v.p. = 0.01900 M.v.p. — 0.66.

Where R.v.p. = ASTM Reid vapor pressure, psi., and M.v.p. = microvapor pressure, mm. of Hg.

Data from which these correlations were made are shown in Table 1. Each value represents the average of seven determinations on each of the 10 materials studied. Only one Reid vapor pressure and two microvapor pressures, one on head A and one on head B, were made from any one sample container.

An indication of the quality of the individual correlations for the two heads is shown by the differences between ASTM Reid and correlative Reid. These differences (Table 2) range from 0.01 to 0.15 psi.

From the statistical summation given in Table 3, the reproducibility of correlative Reid vapor pressure by head A was 0.15 psi.; for head B it was 0.13 psi.

Acknowledgment

Acknowledgment is made of the previous work of John E. Shott and Robert E. Snyder who designed a precursor of this apparatus in 1954. The authors also thank Dr. N. D. Coggeshall and R. O. Clark for their interest and assistance in carrying out this work.

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TABLE 1—AVERAGE REID VAPOR PRESSURE VS. AVERAGE MICROVAPOR PRESSURE

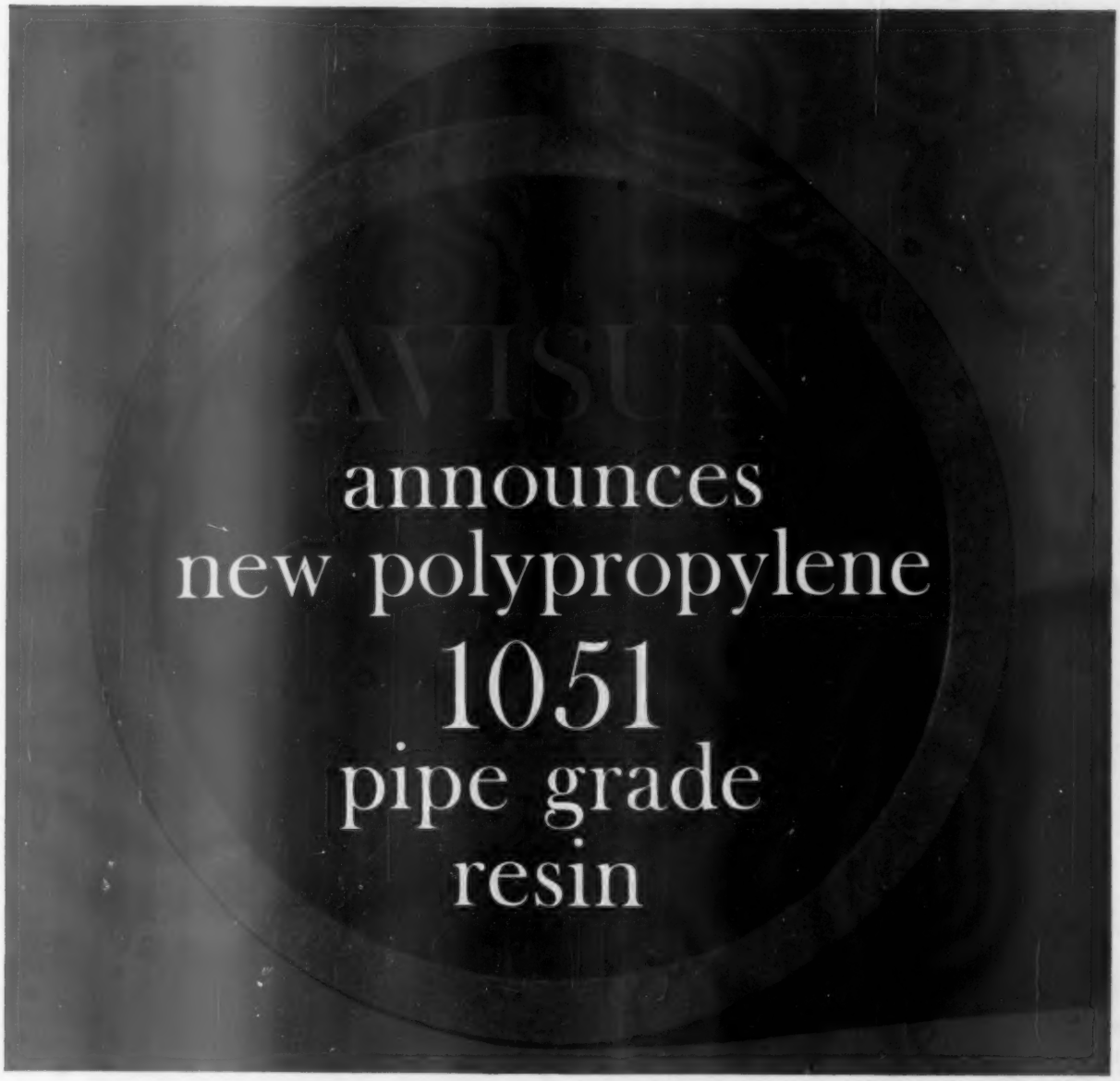
Sample type—	ASTM Reid (psi.)	Microvapor pressure, mm. Hg	
		Head "A"	Head "B"
1. Heavy platformate	0.51	57	58
2. JP-4 fuel	3.01	191	192
3. Alkylate	5.93	354	355
4. Aviation 115-145	6.79	393	393
5. Gasoline No. 1	7.34	420	421
6. Light fluid distillate	9.21	522	522
7. Gasoline No. 2	9.62	540	541
8. Gasoline No. 3	12.11	668	668
9. Gasoline No. 4	14.10	774	775
10. Gasoline No. 5	15.50	851	851

TABLE 2—DIFFERENCE BETWEEN ASTM REID AND CORRELATIVE REID VAPOR PRESSURE

Sample No.	ASTM Reid (psi.)	Correlative Reid, psi.			
		Head "A"	ΔPsi.	Head "B"	ΔPsi.
1	0.51	0.43	+0.08	0.43	+0.08
2	3.01	2.98	+0.03	2.98	+0.03
3	5.93	6.07	−0.14	6.08	−0.15
4	6.79	6.81	−0.02	6.82	−0.03
5	7.34	7.33	+0.01	7.33	+0.01
6	9.21	9.26	−0.05	9.25	−0.04
7	9.62	9.61	+0.01	9.61	+0.01
8	12.11	12.04	+0.07	12.03	+0.08
9	14.10	14.05	+0.05	14.06	+0.04
10	15.50	15.51	−0.01	15.51	−0.01

TABLE 3—DUAL-HEAD APPARATUS STATISTICAL SUMMATION

	Head "A"	Head "B"	Head "A" + Head "B"
Pooled variance, $\Sigma(x - x_i)^2$	428	344	772
Degrees of freedom, $(\Sigma n - k)$	60	60	120
Standard deviation, mm. Hg	2.67	2.39	2.54
Reproducibility, mm. Hg	7.56	6.76	7.04
Reproducibility, psi.	0.15	0.13	0.14



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Arkansas Louisiana Gas puts OK on

Nonlubricated compressors

Five years' experience with "moly"-impregnated rings and packing indicates that lubricating oil may not always be the most satisfactory antifriction agent

BY P. J. CHANDLER
Arkansas Louisiana Gas Co.,
Shreveport, La.

LUBRICATED compressor cylinders have many disadvantages such as oil contamination of downstream dehydrator beds and of pipelines with a resulting loss of efficiency. There is also the cost of lubricators, their operation and maintenance, and of course, the handling and cost of the lubricating oil.

Micarta rings and packing impregnated with molybdenum disulfide has been used by Arkansas Louisiana Gas Co. in its compressor-cylinder operation for 5 years with very good results. On these cylinders, they have been able to eliminate the use of liquid oil lubricants normally applied by pump lubricators and to rely upon the lubricating properties of molybdenum disulfide, commonly referred to as "moly."

Type of service. Following is a general description of units Arkansas Louisiana Gas Co. operates nonlubricated, and their operating conditions. A large majority of the field compressors are equipped with moly rings and packing. These units vary from 30 to 350-hp. skid-mounted direct-driven angle units. During the past 2 years, the company has also placed into operation ten 1,000-r.p.m. direct-driven, horizontal, balanced opposed units in the 225 to 570-hp. range, all moly equipped. These units have liquid separators and in several cases fiberglass filters on the incoming gas stream. In nearly all cases, these field units are operated and unattended.

Paper presented at the 1961 annual meeting of the NGAA in Dallas.

The main-line compressor units operating nonlubricated are 330 to 1,500-hp. angle-type, direct-driven compressors and must have oil-bath scrubbers on the inlet-gas stream. A few of the small main-line units have fiber-glass filters on the inlet-gas stream. The field units, in most cases, compress wet unprocessed gas. The gas handled by the main-line units is mostly gasoline-plant processed gas. Operating pressures vary from suctions of vacuum to 700 psig. with discharge pressures up to 1,200 psig. The compressor rings are nearly all segmental and use no expanders. The compressor jackets operate in most cases without a coolant; however, some compressors operating at compression ratios of over three are cooled.

Arkansas Louisiana Chemical Corp. has one 650-hp. moly-equipped compressor in gasoline-plant propane-refrigeration service, which operated nonlubricated for 4½ years with excellent results. The company has recently equipped other compressors with moly rings and packing which are operating nonlubricated.

Lubricating agent. Molybdenum disulfide, which is chemically MoS_2, is a laminar-type solid in the physical state and is similar in physical structure to other laminar-type solids such as graphite, mica, and boron nitride. Graphite and some of the soft metals such as lead, tin, zinc, and copper have been used for years for their lubricating properties. Moly's lubricating qualities have been known for years but moly was not commercially available until 1948, after which it has had extensive development.

Molybdenum disulfide is made up of an atom of molybdenum sandwiched between two atoms of sulfur. The sulfur has an affinity for metal which causes it to plate and adhere to wear surfaces. The molecules of MoS_2 tend to stack up in layers and under conditions of pressure and movement, slide over each other due to the high lubricity of the sulfur. It will withstand temperatures of 600° F. without oxidation and is generally inert and nonvolatile. Moly is very versatile since it can be mixed with oils and greases, used as a powder, impregnated in various materials, and with a suitable binder can be baked on metallic surfaces.

Rings and packing used by Arkansas Louisiana Gas Co. have been manufactured from micarta which has been impregnated with moly. The author believes that most of the suppliers use the same basic material which costs approximately 20 to 25% more than standard micarta. Teflon rings and packing are also being used for nonlubricated compressors, but their use generally requires piston wear rings which results in an expensive installation. Graphite or carbon rings are also used in this service but high cost and short life limit their use to special installations. Compressor pistons and liners can be coated with moly by a special controlled cleaning and baking process. But this process is expensive since, in addition to the cost of the application, the compressor has to be out of service for some time.

Experience. The company first tried liquid moly in compressor lu-

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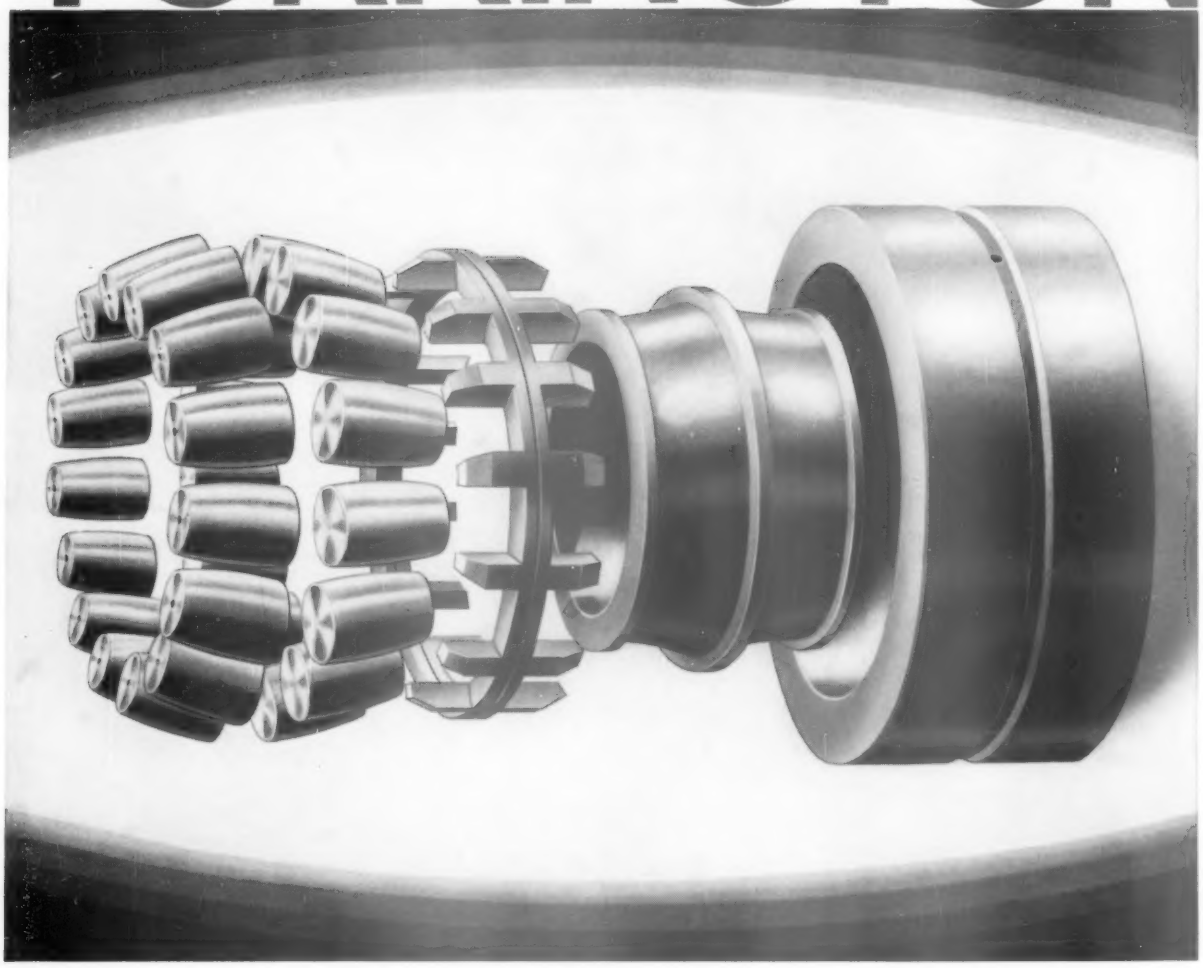

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bricators for break-in about 5 years ago. The packing ran much cooler than normal. After this, one cylinder of a field compressor was equipped with moly-micarta rings and packing. During break-in, the lubricator pumps were operated for several hours after which the oil was cut off. Later inspection checks gave less wear on the moly equipped cylinder than on adjacent lubricated cylinders. Moly-micarta rings and packing were then tried on mainline compressors with excellent results. All new compressors purchased over the past 4 years have been moly-micarta equipped and are operated nonlubricated. To date, we have over 125 nonlubricated cylinders in operation.

Excessive wear has occurred in three nonlubricated liners due to dehydrator aluminum oxide dust and excessive pipeline dirt. Under these conditions, it is doubtful if lubrication would have been of any help. However, in several cases of severe dirt and salt problems, the operators have applied lubrication in an effort to reduce wear and flush out the packing cases.

Moly-micarta packing rings have not, in all cases, given as good service as that obtained with the moly compressor piston rings. In some cases there has been more blowby than with lubricated packing, and in several instances the packing failed sooner than adjacent lubricated packing. However, the operation of moly packing has generally been good, and it is being used for all new and replacement packing. One packing case is now being tried with a combination of moly-coated cast-iron rings and moly-micarta rings with good results to date.

Cylinder-liner and ring wear has been greatly reduced with nonlubricated cylinders. At one station, cylinder wear with lubrication averaged 0.003 in. of wear in the first 10,000 hours' operation as compared to 0.005-in. wear with moly rings and no lubrication. A new nonlubricated field compressor compressing a combination of oil and gas-well gas had 0.0015-in. wear in the first 8,000 hours. After 16,000 hours of operation, the cylinder was again checked and the wear rate was found to be the same as on the initial inspection.

Most new nonlubricated rings and packing have been put into operation with lubrication for a few hours after which it was cut off. However, four new 660-hp. units, each having four compressor cylinders, were put into operation without hooking up the lubricators and oil lines, thereby receiving no break-in lubrication. Normal operation followed these break-ins and typical nonlubricated wear rates have been experienced. One two-cycle 27-in. scavenger piston was equipped with a moly-micarta ring 3 years ago and has been operating since without oil.

Also in this issue:

Detailed cost indexes on refinery equipment, p. 191. This is a feature which the Journal carries in the first issue of each quarter of the year, and which supplements the monthly overall refinery construction and refinery operation cost indexes, below.

Another refining cost feature appears about twice a month under the title, Process Costimating. Latest installment appeared September 11, 1961, p. 148.

COST INDEXES

Refinery construction (1946 basis)

Explained on Page 101 of the issue of August 5, 1957.

	1950	1954	1957	1958	1959	1960	May 1961
Pumps, compressors, etc.	138.2	166.5	206.7	214.7	226.5	228.3	229.4
Electrical machinery	134.9	160.0	188.9	192.7	195.8	195.2	189.2
Internal-comb. engines	126.0	150.5	173.9	178.3	178.5	180.7	180.9
Instruments	127.8	154.6	187.4	194.9	201.0	202.5	207.5
Heat exchangers	140.0	171.7	203.6	181.2	178.9	194.0	186.3
Misc. equip, average	*126.2	160.7	192.1	192.4	196.1	200.0	198.8
Materials component	149.5	174.6	201.9	204.2	207.8	207.6	207.5
Labor component	144.0	183.3	208.6	220.4	231.6	241.9	247.8
Nelson construction index	146.2	179.8	205.9	213.9	222.1	228.2	231.7

*Used in computing the Nelson Index until April 1952.

Refinery operating (1956 basis)

Explained on Page 171 of the issue of June 1, 1959.

	1946	1952	1954	1958	1959	1960	April 1961
Fuel cost	49.6	81.0	86.5	102.1	103.5	109.9	110.7
Labor cost	73.1	88.7	90.9	105.0	102.3	100.3	105.4
Wages	52.4	81.5	88.7	105.4	111.5	113.0	119.4
Productivity	68.3	90.2	97.1	100.3	109.0	112.9	113.2
Investment, maint., etc.	51.2	83.6	92.0	109.5	113.7	116.9	118.1
Chemicals cost	37.0	72.1	85.7	104.4	107.8	114.3	106.3
Operating cost indexes:							
Refinery	58.5	80.5	88.7	105.8	106.8	108.8	110.1
Process units†	62.9	82.2	88.4	105.8	106.0	107.2	110.4

†Add separate index for chemicals, if any are used.

These indexes are published in the first issue of each month. They are compiled by W. L. Nelson, technical editor and petroleum refinery consultant, Tulsa.

Charts of the indexes are published each year in a late January or early February issue.

Indexes of selected individual items of equipment and materials are also published in the first issue of the months of January, April, July, and October.

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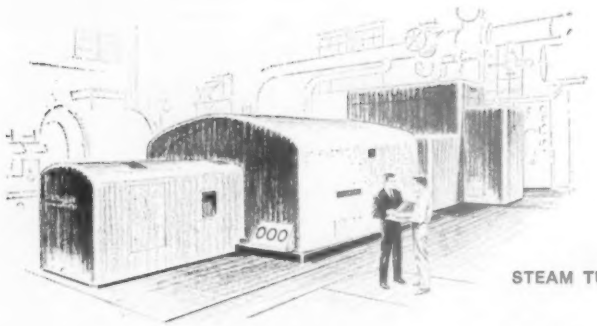

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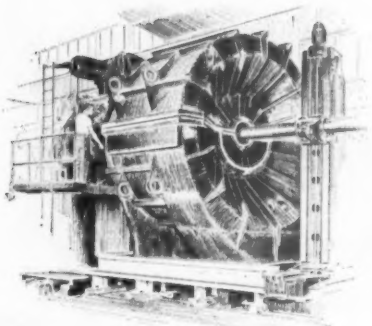

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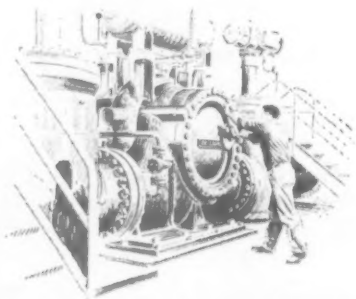

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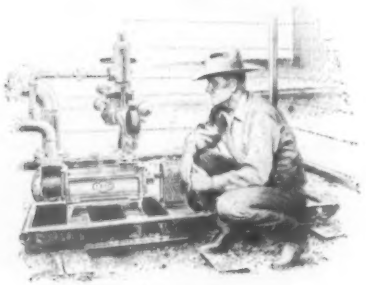

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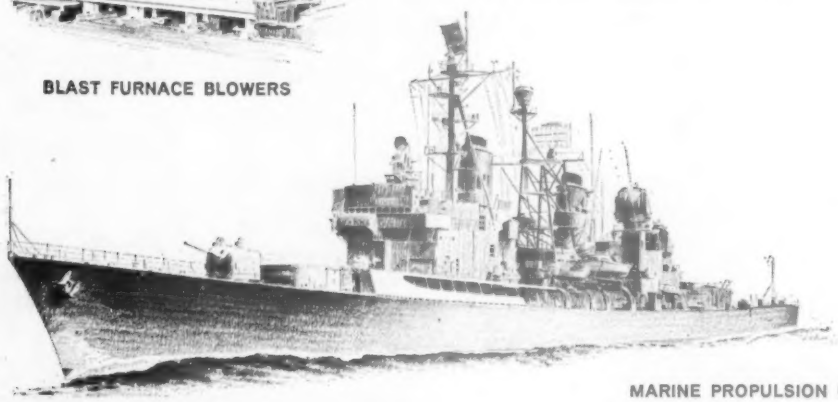

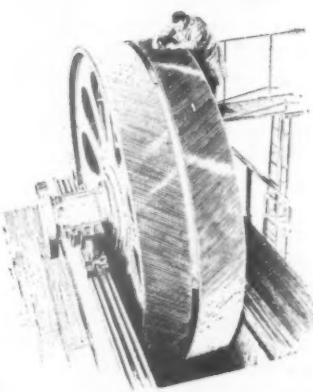

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What's ahead in gas measurement?

New concepts likely to make present methods obsolete; mass meter measuring weight instead of volume has many advantages

BY E. E. STOVALL
Lone Star Gas Co.

A NEW CONCEPT of gas measurement that will make obsolete our present principles, methods, and practices in the not-too-distant future is conceivable. Many relatively new developments have made the old hand-reading method and the adding-machine calculation of charts as well as many other earlier practices obsolete.

Many relatively new ideas regarding the measurement of gas have become realities in the development of new methods and equipment. These are:

Electronic chart integrators, electronic counters for chart integrators, plastic stabilized charts, gas-flow computers, telemetering and microwave equipment, strip charts, automatic chart changers, and 31-day chart drives.

Orifice fittings, look boxes, new and improved gravitometers, mercuryless flowmeters, automatic orifice-plate changers, and new orifice coefficient data and supercompressibility factors.

New meter installation specifications and closer tolerances, chart averager, chart scanner, improved practices using present methods and equipment, new concept of measurement by mass flowmeters, and standard pressure base.

Many new metering devices based on different principles have been advanced in recent years. More are sure to follow and it is entirely possible, even probable, that one or more will eventually be developed that will seriously challenge the position of the old reliable displacement and orifice-type meters. Chief among the new types appears to be the mass meter which measures the weight of the gas, thus eliminating some of the variables such as specific gravity, supercompressibility, and temperature. Although measurement of gas by weight offers many advantages, serious obstacles have interfered in the development of such a meter. This, together with its relatively high cost, perhaps projects its general use to some time in the future.

Expressing a quantity of natural gas in pound units would perhaps enhance our relative position with reference to competitive industrial and commercial fuels. Since 1 M.s.c.f. of natural gas weighs about 45 lb., a $1 bill would buy more pounds of good clean gas than any other type of fuel at the prevailing industrial and commercial rates.

The use of electronic machines in calculating gas-meter charts is gaining in favor among the larger gas companies. One early disadvantage of using these machines was that they were primarily dedicated to other accounting operations and the chart calculations were added as a fill-in to keep the machines busy and thus justify their cost.

Delays harmful. The gas charts were held up until a sufficient number had accumulated for a minimum running time on the machine, were then calculated in short order, and dumped back into the chart office. Chart calculations were alternately behind and suddenly caught up, which was a hindrance in the scheduling of work in the chart office.

The earlier machines were rather slow and limited in capacity. With the advent of new machines which can handle the entire Report No. 3 calculation, requiring little time for preparation in chart offices, more companies are changing to electronic machine calculations of charts. Recently smaller machines have appeared with costs low enough to permit their being assigned exclusively to meter-chart calculation, thus permitting chart offices to retain control of the charts during calculation. These developments point to more general use of electronic machines for meter chart calculation.

Looking into the future, the meter chart may practically pass out of the picture in gas measurement. Devices are already in use which transmit meter data directly to electronic machines for calculation. The use of integrating meters is increasing. The chief deterrent to general use of such equipment is the relatively high cost. Present intensive research in these devices may bring development of models low enough in cost to permit general use.

Results speeded. Presently being used or under development for use with present metering devices are several supplementary time and labor-saving devices that have materially expedited the end results: The automatic chart changer, a device for changing charts on varying time increments without sending a man to the meter where frequent chart changing is desired or required, the motorized machine for averaging chart records, and the automatic chart integrator.

The meter with the built-in integrator can be read intermittently, monthly or otherwise, or can be wired for transmitting the volume

Presented at 1961 AGA Transmission Conference.

to the office or other locations by telemeter or microwave. These can be combination integrator and chart devices whereby the charts can be used for confirming the integrated volume. The telemetering equipment is not new but has been so improved that pressures, differentials, or volumes may be transmitted from the point of measurement to other locations and rerecorded or tabulated on a card system.

Many groups active. The gas industry, the manufacturers of metering and related instruments, the U. S. Bureau of Mines, the U. S. Bureau of Standards, and many research institutes and colleges are continuously, either jointly or separately, conducting research programs for the improvement of present principles, methods, and equipment for metering and related work in the measurement of other fluids. Through several engineering groups and societies here in the United States we are represented in the International Standards Organization, from which we receive information on new measurement techniques of many other countries of the world.

Several research programs on measurement have been and are at present being conducted within our own AGA organization. From these and the many other research and development programs on metering and metering equipment, many new and revolutionary concepts of measurement will no doubt become realities during the working years of many of our young measurement engineers.

Until a completely new concept of measurement has been developed, gas companies burdened with the use of several different pressure bases may have this burden lightened if the program for a common standard pressure base is promoted to conclusion. Some progress has been made.

Standard approved. In 1957 the Pipeline Research Committee of AGA passed a resolution that, "The American Gas Association should express its approval of the universal acceptance of the pressure base now defined by AGA Gas-Measurement Report No. 3." The base defined in Report No. 3 is 14.73 psia. at 60° F.

In 1958 at the Gas-Measurement Superintendents Round Table Conference of the SGA, a committee was appointed to promote the acceptance by industry of a standard pressure base. In 1959 this committee made a proposal to the Transmission Management Section of SGA that the section publicly endorse adoption of the Report No. 3 pressure base as a standard for volume quality measurement. At its meeting in March 1959, the SGA Transmission Management Section sent its endorsement of the proposal to the AGA where it was referred to the gas-measurement committee. Formal endorsement by AGA is anticipated in due time.

The biggest hurdles in the way of universal acceptance of the standard pressure base are probably the various state gas-measurement laws which would have to be amended. This can no doubt be accomplished in time and the industry can look forward eventually to having a standard unit of measurement for its product.

Would eliminate base. In the event of the development of an accurate, practical, and economical mass meter which would measure gas by the pound, many of our present problems, including the one on pressure base, will have been eliminated. However, it is not anticipated that such a meter will eliminate many other work phases required of our measurement people. We will continue to need manpower, good engineers, and technicians in the field to operate and maintain any newly developed device. We will also continue to need highly skilled office personnel for the collection, recording, and dissemination of gas-volume information.

An ideal concept of "What can be ahead in gas measurement" would be a simple and inexpensive device installed at the point of measurement that would at all times indicate the rate of flow and totalize the volumes passing, with facilities for transmitting these data to machines, all operated electronically and so arranged that the personnel would merely punch a key or a botton to get information intermittently and/or to complete a meter statement for billing or for the writing of a check for payment of gas purchased.

Such new tricks may be difficult for the old dogs, but to the new electronic and space hounds now coming along, it may be somewhat easier.

ADJUSTING a portable pipe straightener to the level of the pipe to be reconditioned makes the job easier and faster.

Stands under pipe straightener facilitate pipe reconditioning

WHEN portable pipe straighteners are used to recondition pipe, a simple means of keeping the pipe level as it is run through the straightener is to place stands on each corner of the unit so that it is on the same level as the pipe to be straightened. Then, when each joint is rolled off the rack, it can be easily "endo-ed" through the straightener and across to the storage rack.

The stands are easily constructed by welding short pieces of 2½-in. pipe nipples to the corners of the straightener and making legs out of 4-ft. pieces of 2-in. pipe with plates welded on the bottom. When the unit is on the road, the stands are drawn up into the collars and held in place with a set screw. When on the job, the unit is jacked up and leveled and the stands lowered to hold the straightener in position.

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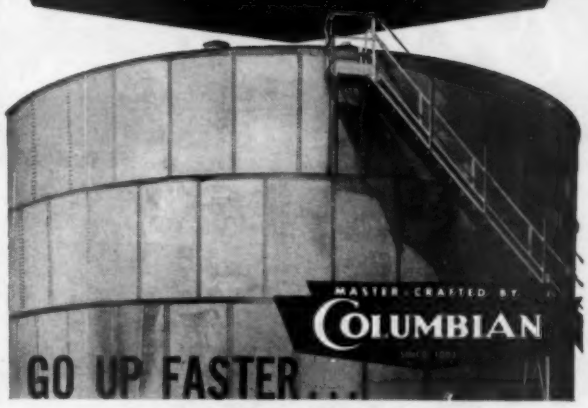

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Wheland HP-16000 in Kingfisher County, Oklahoma. Left to right: Lavoy "Dink" Klutts, Tool Pusher; Jimmie Lynn Austin, V.P.; Paul Austin, Treas.

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Seminole, Oklahoma

August 1, 1961

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The Wheland Products
Division of Gordon Street, Inc.
Chattanooga, Tennessee

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As you know, we have used Wheland pumps for many years. From our own experience we became convinced that the Wheland HP-14000 Pump couldn't be beat.

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The new planetary gears let us use a much smaller sheave. The cylindrical crossheads, oversize bearings and the big gear reduction make the pump easier to pull, run smoother, and do a better job.

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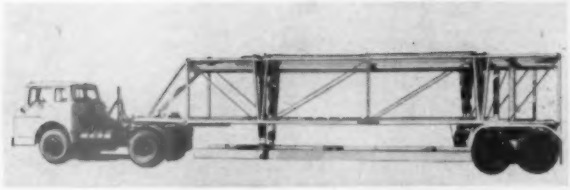
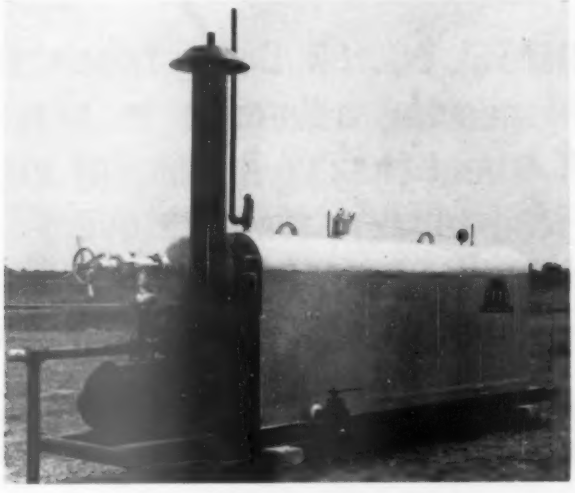


Straddle lift moves pipe fast

WITH this Strad-O-Lift trailer, you can back up, straddle a load of pipe, and transport it to the job site at highway speeds. The trailer hitches to conventional truck tractors and is equipped with adjustable hydraulic lifting shoes which operate by power takeoff from the tractor. By operation of a lever in the cab, the driver can open, close, raise, and lower the shoes.

All models have a built-in landing gear, ball-bearing lift screw, and spring-loaded binders. Source: **Towmotor Corp.,** 16100 Euclid Ave., Cleveland 12, Ohio.



Heater-treater for cold weather

COLD WEATHER need not slow down production operations when a new packaged gas unit heater-separator is installed at the wellhead, according to the maker. The package comprises a skid-mounted integral heater-separator combination that is piped and ready for field connections.

It incorporates all the functions of a heater-separator wellhead installation in one unit that can be installed quickly. The liquid section of the separator forms an integral part of the heater which transfers enough heat through the separator shell to the liquid to hold the temperature above the hydrate point under most conditions, thus allowing the gas temperature to be operated below the hydrate formation temperature and up to temperatures required for pipeline flow, the maker says.

The separators are available in both two-phase and three-phase models. The packaged units are available for dual as well as single completions and are provided with dual separators, heaters with split bundles, and individual liquid and gas controls. Source: **O'Neill Tank Co., Inc.,** P. O. Drawer 771, Great Bend, Kans.

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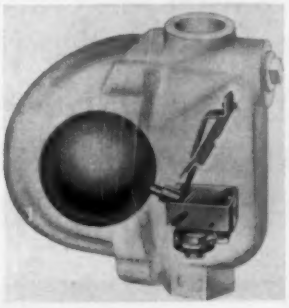

New steam trap

A float type of thermostatic steam trap has been brought out that is equipped with a stainless-steel bimetal thermostatic air vent which the maker claims is indestructible. The trap provides continuous discharge of condensate and air.

The trap has no pivots to wear or cause the trap to stick. All working parts are made from stainless steel. In-line inspection of the trap can be made by removing the body housing. The trap is expected to find use on unit heaters, heat exchangers, and similar equipment. Equipped with ¾-in. pipe threads, the trap comes in three pressure ranges: 0-30, 0-75, and 0-150 psi. Source: **Farris Engineering Corp.,** Commercial Ave., Palisades Park, N. J.

1962 DODGE HALF-TON PICKUP

ANNOUNCING THE 1

FROM 1/2-TON PICKUP TO DIESEL POWER, Dodge trucks for 1962 feature more than 50 engineering advances to make them tougher, more tight-fisted. ■ And they're on display right now at your Dodge dealer's, priced to compete with every full-size truck rolling the road. ■ Whatever your trucking job, there's a tough Dodge to do the job better, faster, more economically.

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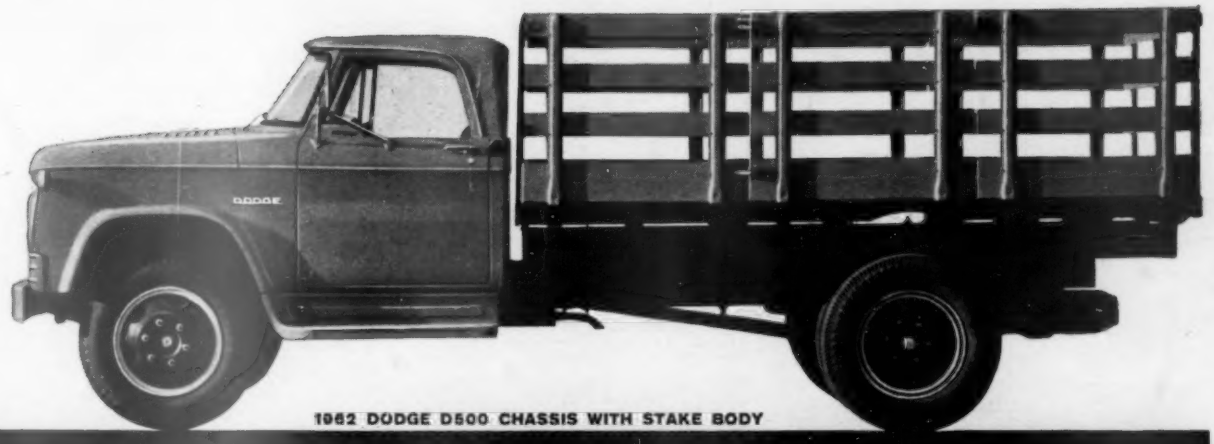

1962 DODGE D500 CHASSIS WITH STAKE BODY

962 DODGE TRUCKS

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1962 DODGE C700 GASOLINE-POWERED TRACTOR

Instrument detects static charge

Where inflammable liquids are handled and stored, this new electronic instrument may help make operations safe as it can be used to detect the static charge differential that exists between improperly grounded or bonded objects.

The Model SWE-1125 static meter features a green-red go-no-go dial face that shows at a glance whether or not the ground or bonding connections in an area are good. Battery-powered and voltage-operated, the instrument reads electrostatic charge—not resistance. Energy as low as 1 millimicro joule from the measured source will actuate the indicator. The meter indicates whether the charge is negative or positive.

To use the instrument, the operator holds it in one hand, like a gun, and touches its snub nose to the object to be tested. With his other hand, the operator touches the place to which the object is supposedly grounded or bonded. He then pushes the button on the hand grip and observes the meter. Source: **B. K. Sweeney Mfg. Co.,** 6300 E. 44th Ave., Denver 16, Colo.

•

Fire-protection cutoff valve

A fusible link holds the gate on this new cutoff valve open against the force exerted by two stainless-steel springs. At a predetermined temperature, the link melts and lets the springs snap the valve closed. The shutoff action of the valve can be used to stop the flow of flammable liquids to fire areas.

The valve can be installed in any position and comes with flanged ends in several types of stainless steel in sizes from ½ to 6 in. for working pressures to 150 psi. Links are available for several melting temperatures. If necessary, the valve can be reset without the link to permit draining of fire-endangered tanks to a safe area or to meet other needs. Source: **Cooper Alloy Corp., Valve & Fittings Div.,** 100 Bloy St., Hillside, N. J.

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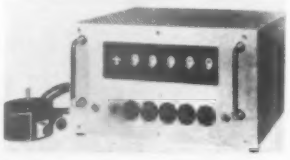
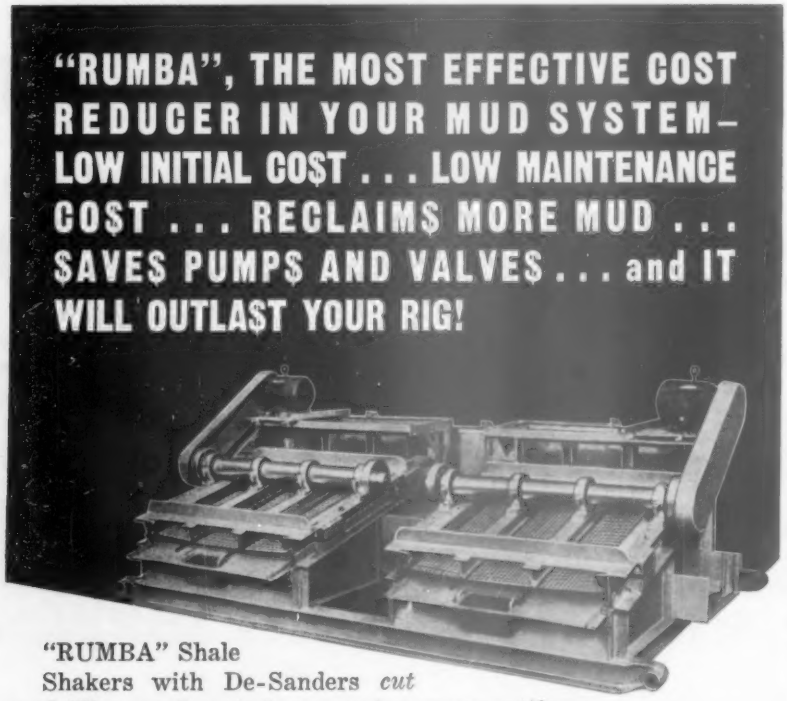


Bidirectional counter for control

Where there is a need for reading or controlling position accurately, a new bidirectional counter can serve as a precision readout device or as the key element in an automatic control system, as it indicates true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position while going through zero in either direction.

The counter normally works in conjunction with a transducer which converts motion to electrical pulses. The counter converts the pulses to visual readouts and to digital type of electrical readout for information storage and process control. Source: **Crane Co., Hydro-Aire Div.,** 300 Winona Blvd., Burbank, Calif.

•

New bag keeps caustic soda dry

Flake caustic soda users can now obtain soda in a new moistureproof disposable bag which is designed to keep the soda dry during shipment and storage. The new bag has high mechanical strength derived from the use of multiple high-strength kraft-paper construction.

A heavy polyethylene coating on the exterior and two inner plies help make the bag moistureproof and increase the reinforcement. A separate liner or inner bag of sturdy polyethylene with a 6-in. foldover that serves as a check valve makes the container moistureproof. The check-valve feature permits any trapped air to be expelled for easy stacking and prevents moist air from reaching the flake caustic soda. The exterior polyethylene coating permits spillage to be removed by hosing down the bag with water. Soda is available packaged in the new bag in 50 and 100-lb. sizes. Source: **Frontier Chemical Co.,** P. O. Box 545, Wichita, Kans.

•

Two-way radio for 450 mc.

Business communications can be carried on over the relatively uncrowded UHF 450-mc. band with a new line of two-way mobile radios just announced. The equipment is said to provide certain advantages of operation at the ultrahigh frequency at an initial cost comparable to that of VHF equipment.

Communications in the 450-mc. band are considered to be subject to virtually no interference from skip signals, ignition noise, and adjacent channel operation.

The mobile equipment will be offered in a frequency range from 450 to 470 mc. with a power of 15 watts. Two models will be offered: one for 12-volt operation; the other for either 6 or 12 volts. Source: **Radio Corp. of America,** 30 Rockefeller Plaza, New York 20, N. Y.

Pipeline pig of foamed plastic

This new pig promises to be helpful to remove water after hydrostatic pipeline tests. The Sweegee foamed-plastic pig is molded in a cylindrical shape and comes in sizes

Oil company reports PERFORMANCE PLUS with Sumitomo steel tubing

A leading drilling company in Texas reports that Sumitomo tubing far exceeded API specifications when run as drill string, despite 46 rugged round trips in and out of a 5700-ft. well under 1200-lb. mud pressure.

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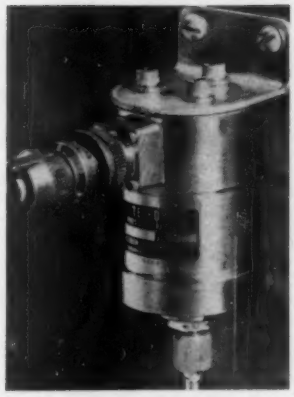
for pipe with inside diameters to 48 in.

The maker claims it has proved to be extremely efficient for removal of liquid, sand, debris, and distillate, and that it will go around short-radius 90° or 180° bends and will traverse pipelines that have different wall thicknesses or reduced diameters. Source: **Sweco, Inc.,** 1301 Prudential Bldg., Houston 25, Tex.

●

Inhibited descalant

Solutions of a new inhibited scale and oxide remover, when used in a closed system, may be heated to 180° F. to achieve fast descaling and derusting. According to the manufacturer, the product remains stable at high temperature, has a high tolerance for sulfur dioxide and ferric ions, reduces the hazard of copper ions depositing on steel, has a degree of inhibition in the vapor stage of the solution, and has good rinsability with hot or cold water. Source: **Oakite Products, Inc.,** 159 Rector, New York 6, N. Y.



Pressure transducer for 5,000 psi.

Three versions of the Teledyne pressure transducer are now available for precise pressure measurements under adverse conditions. They produce an output voltage proportional to the pressure applied within ±0.25% of full scale output.

When a force is applied to the sensing element, a linear resistance change occurs which is proportional to applied pressure. According to the maker, the Model 206 transducer and its two variations are suited to the sensing and precise measurement of such dynamic pressures as those encountered in high-speed chemical reactions and in engine tests. Source: **Taber Instrument Corp.,** 107 Goundry, N. Tonawanda, N. Y.

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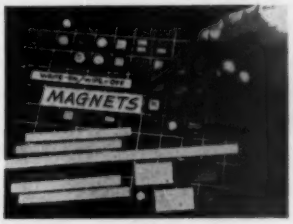

Colored magnets aid charting

Magnetic scheduling and charting boards are proving helpful in supervisory control and related operations. A line of colored magnetic indicators is now available in many shapes and sizes for use in such charting operations.

The magnetic indicators are finished with a special writeon, wipeoff surface that permits writing on them with a marking pencil for ad-

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FACTS ABOUT THE EXCITING

FACT 1—Lark's wheelbase is a comfortable 113". Pioneered by Lark for fleet use 4 years ago (but only now being adapted by competition), the medium wheelbase is considerably longer than the little compacts' and assures a better ride on any surface, plus the "solid" feel so important to the driver.

FACT 2—Lark's over-all length is a sensible 188". Compared to other "new-size" cars, which measure upwards of 196" over-all, '62 Lark's almost total absence of deadweight overhang is an important economy factor. Relatively short length also guarantees easy parking and space-saving storage and shop room.

FACT 3—Lark's front headroom is 36". Front legroom 43.5". This means more comfort for driver and one **or two** front passengers. Wide front doors have no big, knee-knocking doglegs; they do have flush floors (no wells); a man can get in and out of a '62 Lark without knocking his hat, tripping or skinning his shins.

- ✓ **LOWEST-PRICED OF THE "NEW-SIZE" CARS**
- ✓ **MORE LEGROOM THAN ANY CAR PRICED UNDER $5,000**
- ✓ **OPERATING ECONOMY PROVED IN OVER 1,000 FLEETS**
- ✓ **ENDURANCE-BUILT BY STUDEBAKER FOR YEARS OF SERVICE**

There are many other Fleet-size '62 Lark **facts** that you, as a fleet operator, should know. These include Lark's new and more efficient rust-proofing, its 12 new noise-suppressors, exclusive front—**and rear**—standard seat belt anchorages and other Lark economy, safety and comfort advances.

You should also know about the fleet records Lark has made in economy, long life, high trade-in value, low maintenance costs and freedom from frequent repair and adjustment necessity.

For complete information, specifications, a full list of available options and a report on Lark's suitability for **your particular** type of fleet or fleets, fill out, clip and mail the coupon. **When you balance your books, you might be very glad that you did!**

NEW '62 *FLEET-SIZE* LARK

FACT 4—Lark's rear legroom is 49". Only the biggest cars, like Cadillac, have more rear legroom than Lark. Rear seat passengers can stretch their legs and really relax. Same flush floors and wide doors as up front, make getting in and out easy. Redesigned trunk roomier than ever, has low-cut opening for easy loading.

FACT 5—Lark's new ladder-type frame is 20% stronger. Rigidly bolted to the heavy gauge steel frame is Lark's solid, welded steel body. This construction is the safest known and the easiest, fastest and least costly to repair after crash damage. Bolted-on fenders, easy to replace—an unskilled laborer can do it in minutes.

FACT 6—Lark offers widest power choices. Lark's standard Six is 112 HP. You also have 4 choices of V-8 engines, from 180 to 225 HP. Four transmissions — including gas-saving overdrive — and six rear axle ratio choices (the latter at no extra cost), make it possible to power-match the '62 Lark to every specific fleet need.

NEW '62 LARK

STUDEBAKER

Maker of America's best-built cars and trucks

GET THIS VALUABLE INFORMATION RIGHT NOW!

Send me all the data on the '62 Fleet-size LARK and your special Report on its particular suitability for my usage in fleet operation.

Name_____

Title_____

Company_____

Address_____

City_____ Zone____ State_____

Please check the following: **Type of business.** Public utility ☐ Taxicab ☐ Rental and/or lease ☐ General business ☐ Oil industry ☐ Municipal ☐ State ☐ Federal Gov't. ☐ Police or patrol ☐ **Number of units in fleet.**_____

Mail your coupon to: Mr. A. E. Fitzpatrick, Mgr. of Fleet Sales, Studebaker, South Bend 27, Indiana.

ditional coding. Flexible strip magnets that can be cut to any length or shape are also available with the same type of surface finish. Source: **Wm. A. Steward Co., Rol-a-chart Div.,** P. O. Box 291, Mill Valley, Calif.

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Empty-hole geophone developed

This new geophysical aid is claimed to remove the need for liquid-filled holes in obtaining seismic velocity surveys. The tool reportedly will permit surveying in air and gas-filled holes and result in a substantial reduction of exploration costs in many areas.

The tool locks against the borehole wall at any desired depth by control from the surface. In tests, it has locked in all types of formations and casing and in hole sizes from 4 to 14 in. The geophone is a variable - reluctance velocity type with a natural frequency of 25 c.p.s. Source: **Seismograph Service Corp., Birdwell Div.,** Box 1590, Tulsa, Okla.

Heralding
Thompson of FIRST
Sir Elmo — the Banker's Banker!
This light-hearted crest tells you that law-oil-banking is the business career of Elmo Thompson, First National Chairman. Elmo is one of many at First with direct experience in the petroleum industry; men who understand your needs, your problems, speak the language of oil. And you'll find one of the nation's largest oil credit files, and one of the oldest oil departments in American Banking. Visit us.
Think . . . 1st of Tulsa
FIRST NATIONAL BANK AND TRUST COMPANY
SINCE 1895

Free-wheeling vehicle drive hubs

Tire and front-end wear on four-wheel-drive vehicles can be reduced considerably by installation of free-wheeling drive hubs now on the market, the maker claims. Called a Husky Hub, the device is a self-engaging hub designed to be set by a twist of the actuator. It is said to be leakproof.

The hubs are claimed to reduce operating and maintenance costs of four-wheel-drive vehicles to those of two-wheel-drive vehicles, and to permit higher road speeds without drag or noise. Source: **Tradewinds, Inc.,** Box 976r, Boulder, Colo.

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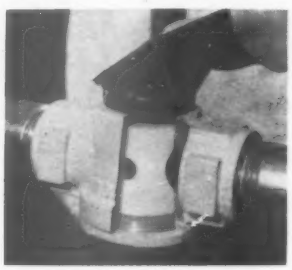


Ball valve adjusts easily

A ball valve consisting of only seven parts and featuring a sealing capsule of conical-shaped teflon molded around the ball is available in sizes from ⅛ to 2 in. for working pressures from vacuum to 1,440 psi. Requiring no lubrication, the valve is designed for use in handling gases, liquids, or slurries, and is easily adjusted by tightening the base plate.

Called the Con-O-Sphere, the valve can be rebuilt in the line, if necessary, in about 3 minutes, the maker says. When the base plate and handle are removed, the sealing capsule drops out. To rebuild the valve, all that is required is to replace the capsule and stem seal. Source: **W-K-M Div., ACF Industries, Inc.,** P. O. Box 2117, Houston 1, Tex.

LIKE DRILLING WITH 1940 DOLLARS

XP-20 SPERSENE MUD SYSTEMS

YOUR MONEY CAN GO TWICE AS FAR

Your dollar went twice as far in 1940 as it goes today, and your dollar can go almost twice as far now when you drill with new XP-20/Spersene mud systems. In over 155 wells drilled to date with XP-20/Spersene muds, savings have been phenomenal. Cost of mud has been slashed, frequently as much as 50 per cent, and total cost per foot has been greatly reduced, too. In 1940, Magcobar entered the drilling mud field with fair and reasonable mud prices. Now, with XP-20/Spersene systems, Magcobar offers a mud advancement that combines performance for today's conditions with a return to yesterday's simplicity and economy. XP-20/Spersene systems are like drilling with 1940 dollars and 1961 technology. They give improved inhibition, improved heat stability, and improved flow properties to almost double the buying power of your mud dollar.

MAGNET COVE BARIUM CORPORATION / Houston, Texas.

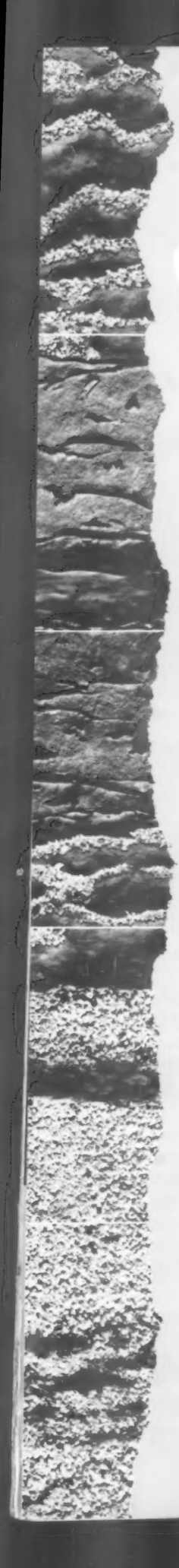
Magcobar
Complete
DRILLING MUD SERVICE

DRESSER INDUSTRIES, INC.
OIL • GAS
CHEMICAL
ELECTRONIC
INDUSTRIAL

Well Done With 1961 Magcobar Technology

Case History information on XP-20/Spersene jobs available at Magcobar's Houston office.

PIPE
FORMATION
CASED HOLE
Amplitude curve of
free pipe
up the hole
Good pipe bond,
good formation bond
Good pipe bond,
good formation bond
Poor pipe bond,
unknown formation bond
Good pipe bond,
poor formation bond



WELEX FIRST AGAIN!

Introducing . . .

a cement bond log that reliably logs both sides of the cement sheath

The new Welex Acoustic Cement Bond Log does the most complete job in the business. It "sees" the **formation acoustic bond** as well as the pipe acoustic bond. It works equally well in hard rock country, sand or shale.

Other logs show the pipe bond all right, but nothing about the formation bond. And they work well only in soft formations at that. Pretty limited. Not much to base a completion job on.

Using the Welex system, evaluation of the pipe and formation bond is possible in many areas with only the pipe and formation amplitude curves run in the cased hole. Under certain conditions, especially in hard rock country, the Welex Cement Bond Log employs three acoustic amplitude signals: one for the pipe, one for the formation after casing is set, and one in the open hole for formation evaluation before casing is set. A caliper log in the open hole can be run concurrently to provide auxiliary data.

Proper evaluation of the two—or three—curves locates precisely the area of the poor bond—whether pipe or formation. If squeezing is necessary, the logs tell you exactly where. The reliability of the new Welex Cement Bond Log has been proven in numerous tests.

It is a fact that communication can occur behind the cement even when the pipe bond is good. This condition can lead to costly remedial work. By accurately logging **both sides** of the cement sheath, the new Welex Log can now save thousands of dollars per well. Let the man from Welex show you.

COMPLETE WIRELINE Welex SERVICES

WELEX

A Division of Halliburton Company

General Offices: 1728 Old Spanish Trail, Houston, Texas

ALL IN A DAY'S WORK—Turbocharged Thermodyne diesel-equipped Mack has power to spare for hauling the oil-field tractor being pulled down in the pipe yard of O. R. Burden Construction Corp. Company selected this Mack six-wheeler after 17-Mack fleet in Iraq and its domestic fleet proved unequaled in economy, durability and performance.

MACK
for over 8 straight years
NO. 1
by far in sales of diesel trucks

IT HAD TO BE MACKS!

"In September, 1959, our company was awarded a contract for construction of 317 miles of pipeline in Iraq," says Mr. J. S. Burden, president of O. R. Burden Construction Corp., Tulsa, Okla.

"After careful study of the hauling requirements for this project, and as a result of our domestic trucking experience, we chose Mack trucks over all competitive makes for our medium and heavy transport needs. We certainly made the right choice.

"We've found pipeline construction hauling everywhere is more efficient with Macks on the job . . . and their excellent performance overseas and in this country certainly influenced us in our latest purchase, a 72,000-lb. GCW Turbocharged Thermodyne® diesel-powered Mack B Model tractor," says Mr. Burden.

What are the reasons behind Mr. Burden's high opinion of Mack trucks? Some are: eight miles per gallon of fuel with full loads of pipeline construction equipment . . . minimum downtime despite the rigors of remote construction jobs in the United States and in the Persian Gulf area . . . and Macks' ability to stand up and come back for more regardless of terrain, weather or service.

You can have the most dependable, economical truck transportation, too. Simply call in your nearby Mack representative. When you've heard the full story, you'll agree "It has to be Macks!" Mack Trucks, Inc., Plainfield, New Jersey. Mack Trucks of Canada, Ltd., Toronto, Ontario.

9097

MACK
FIRST NAME FOR
TRUCKS

TRADE LITERATURE

Wrench, tool catalog

This 128-page publication, now available free, outlines wrenches and hand tools for production assembly, maintenance work, and product service. The catalog describes tools such as manual and hydraulic gear pullers, electric drills, sanders, grinders, and electronic and electrical instruments for diagnosing engine operation in fleet-maintenance shops. Source: **Snap-On Tools Corp.,** 8126 28th Ave., Kenosha, Wis.

Drilling-mud surfactant

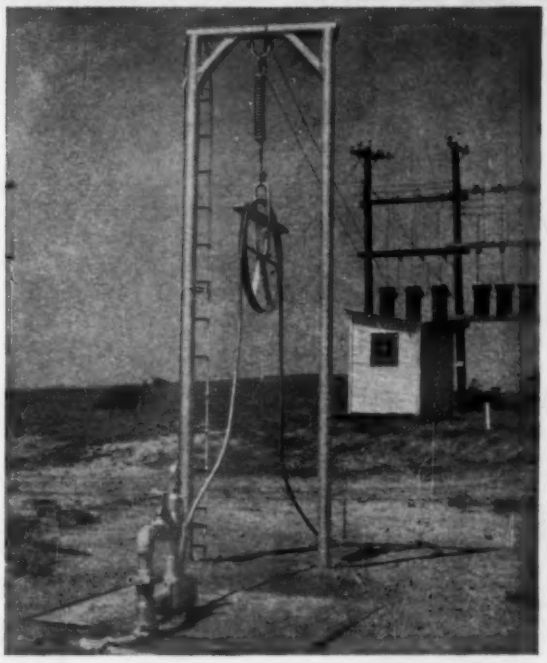
Recently made available free to interested persons, this eight-page bulletin defines drilling-mud surfactant (DMS), tells what DMS mud is along with its advantages. It gives special tests for the mud and includes temperature tolerance. The back cover offers a series of features and advantages. Source: **Baroid Div., National Lead Co.,** Box 1675, Houston 1, Tex.

Diaphragm-pumps

Catalog DP-1059 (four pages) features 2 and 3-in. Skwee-Gee diaphragms along with 3 and 4-in. ball valve and flap-valve diaphragms. Highlighted is the "vertical stroke," said to greatly lengthen the life of the Skwee-Gee pump. Included are specifications and performance tables. Source: **Construction Machinery Co.,** 1939 Loveall St., Waterloo, Iowa.

Accurate transmitter

Pneumatic transmission of flow, normally used in conjunction with such differential producers as venturi tubes, dall flow tubes, venturi nozzles, or orifice plates, is described in new Specification Data Sheet 281-01.201-1, featuring the Model 281-01 transmitter. According to the data sheet, the transmitter receives differential pressures on surfaces of mercury in two wells. A cam and pneumatic-transmitter mechanism transforms these pressures to an output pressure proportional to the main line flow. The four-page literature contains illustrations, basic descriptions, and



REDA DOES THE JOB BETTER AND AT LOWER COST!

For this flood project a Reda Submergible Electric Pump is in operation. It is one of the thousands of installations for which Reda Submergible Pumping Units were selected.

HERE'S WHY:

PROVEN PERFORMANCE

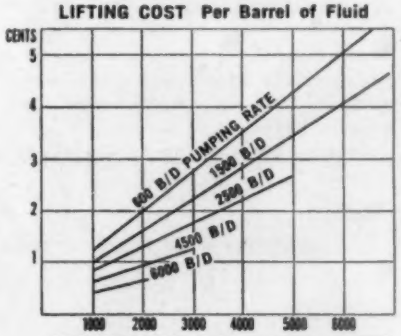
Over 80 million barrels of oil have been recovered profitably from wells which would have been abandoned as unprofitable producers.

PROVEN ECONOMY

Average cost of producing with Reda Submergible Pumps is less than one cent per barrel of fluid for each 1,000 foot lift.

A COMPLETE LINE

Reda Submergible Pumps are designed to meet every pumping need — for wells with small fluid volumes, large fluid volumes, new wells or secondary recovery operations. Daily production rates from 20 barrels of oil to 18,000 barrels of salt water producing less than 1% of oil. Depths of wells are from 450 feet to 13,000 feet. Complete line from ⅓ H.P. to over 300 H.P.



*Included: Electric Energy (10 Mills Per KWH), Run and Pull, Repairs, Upkeep, Transportation, Labor and Amortization (8 Yrs.)

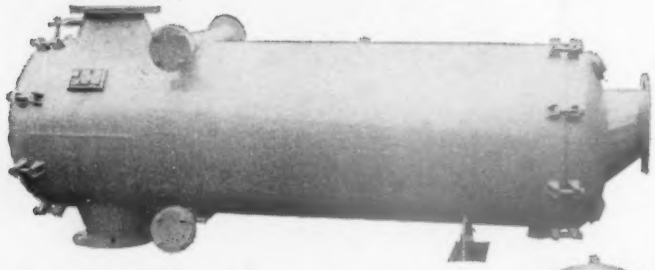
Write for Bulletin R-686 Today

SIGN OF QUALITY SUBMERGIBLE REDA PUMPS

REDA PUMP COMPANY / BARTLESVILLE, OKLAHOMA

Manufacturers of Submergible Electric Motors & Pumps for over 40 years
Pumps for Oil, Brine, Water, Gasoline, Jet Fuel, Chemicals, LPG

ACCESSORIES for increased engine EFFICIENCY



EXHAUST HEAT EXCHANGERS
Engineering Controls manufactures exchangers for all waste heat recovery requirements. Standard or Custom design available in all sizes. You get **maximum** use from waste heat, for producing steam, heating water, and processing fluids, with an Engineering Controls Exhaust Heat Exchanger. Available with or without silencing elements.

AIR TANKS
Stock sizes available with your choice of base, mounting and openings, and at a variety of pressure ratings. They are fabricated to meet ASME, ABS, U. S. Coast Guard and National Board Standards in design and manufacturing.

SILENCERS
Engineering Controls offers a complete line of dry silencers for use with any internal combustion engine. They produce a high degree of silencing, at minimal pressure drop, in either commercial or residential models. Reduce back pressure, improve engine performance with an Engineering Controls Exhaust Silencer.

Sole Developers and Manufacturers of
Vapor Phase® Thermal Circulation (Ebullition)
Engine Cooling Systems

6107

E C
VAPOR PHASE

ENGINEERING CONTROLS, INC.
An affiliate of St. Louis Shipbuilding & Steel Co.
611 E. Marceau • St. Louis 11, Mo.

specifications. Schematic drawings show dimensions and a typical installation of the instrument. Source: **B-I-F Industries, Inc.,** Box 276, Providence 1, R. I.

Power cleaning tools

This newly revised bulletin covers four power cleaning-tool models available—two sizes each in electric and pneumatic power—and describes their use for removing accumulations from hard surfaces. According to the six-page bulletin, applications of the Aurand tools include scale, rust, corrosion, and paint removal; cleaning of accumulated concrete from forms and equipment; epoxy-resin removal; and limestone surface finishing. Source: **Aurand Mfg. & Equipment Co.,** 1324 Ellis St., Cincinnati, Ohio.

Premium lubricants

This comprehensive, 20-page, plastic-bound booklet offers a valuable collection of information featuring the basic concept of molybdenum disulfide additives used to enhance temperature capabilities of lubricants. It contains two pages of charts, diagraming the reduction of frictional resistance between moving parts. Included are sections showing functional operation, physical properties, and practical application. Source: **Hercules Packing Corp.,** 11061 Walden Rd., Alden, N. Y.

Asphalt blending

This new data (24 pages) discusses production and distribution problems such as blend rates and temperatures, selection of diluents, control of additives, remote registration, and tank storage. Solutions are recommended. The data sheet and accompanying literature contain illustrations, schematic diagrams of typical installation, flow diagrams, and a thorough description of the operation, uses, and advantages of equipment for the blending of asphalt or other similar applications. Source: **B-I-F Industries, Inc.,** Box 276, Providence, R. I.

Professional advancement

Now available is the eleventh booklet in the current "professional-advancement" series. The publication suggests methods for control-

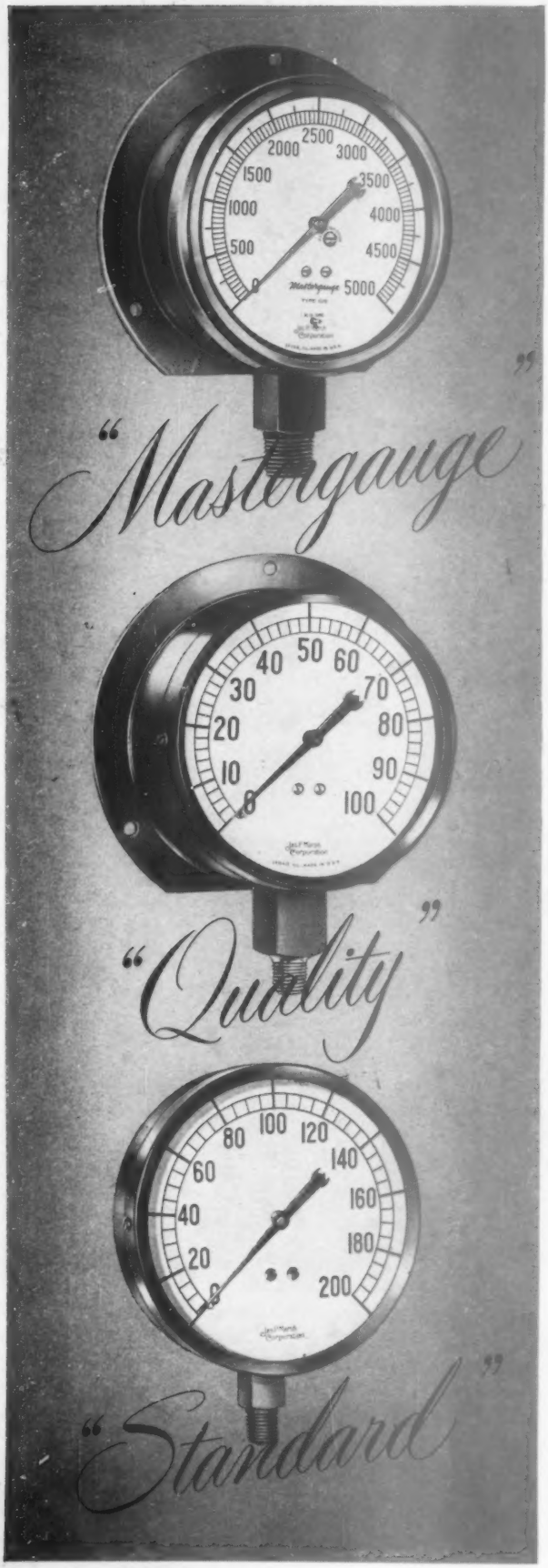
the spring is the thing!

BJ Red Top Centralizers have been proved best by competitive test. Exclusive pre-stressed springs assure extra centering force for a smooth, even cement sheath all the way down. No welds to fail, no rivets to pop—springs are held in end cages by their own stress. Easy insertion into hole—pre-stressing allows slim design, full cement flow around casing. Alloy steel springs fulcrum on cages—casing always rotates freely! Easy to install...available in all API casing sizes through 10¾" O.D....choice of four spring cambers with each size.

BJ Red Top Scratchers—perfect companion tool to BJ Centralizers. Thanks to patented design with Coil-Flex Fingers, scratchers can go to bottom before being activated—an exclusive BJ feature!

Byron Jackson Tools, Inc.
A SUBSIDIARY OF BORG-WARNER CORPORATION
P.O. Box 2017-A, Terminal Annex, Los Angeles 54, California • Export Address: 580 5th Avenue, Suite 510, New York 36, N.Y.

BJ



What pressure gauge for your particular need?

The clear-cut economical answer to your specific gauge problem is right here in the Marsh line. It is here because the Marsh line contains the world's most complete range of gauges in the three broad brackets of gauge applications.

THE "MASTERGAUGE" GROUP...for those extreme services that demand the ultimate in gauge precision, accuracy and stamina.

THE "QUALITY" GROUP...also for tough conditions, but less severe than the conditions served by the "Mastergauge" Group.

THE "STANDARD" GROUP...for the general run of pressure gauge services.

While these three brackets run a wide gamut of prices, the difference between them is not so much a matter of *grade* as a matter of *kind* and *purpose*. All gauges in all groups reflect Marsh precision and quality. Collectively they cover practically every conceivable gauge requirement.

The answer is in the catalog...but if you have a special problem let our engineering department work with you to select the most efficient, most economical solution to your problem.

MARSH INSTRUMENT COMPANY
Dept. L, Skokie, Illinois

Division of Colorado Oil and Gas Corporation
Marsh Instrument & Valve Co. (Canada) Ltd., 8407 103rd St. Edmonton, Alberta, Canada.
Houston Branch Plant, 1121 Rothwell St., Sect. 15, Houston, Texas.
Eastern Seaboard Warehouse: Marsh Instrument Company, 1209 Anderson Ave., Fort Lee, N.J.

In stock at your nearest Supply House

MARSH

"THE STANDARD OF ACCURACY"

ling development of new-product ideas from inception to marketing. It states that these methods have been tested and proved by firms whose standard products have become obsolete and whose future growth depends upon a continual flow of new products. Reading time for this 4 by 8½-in. booklet is about 15 minutes. Source: **Heat Exchanger Div., Western Supply Co.,** Box 1888, Tulsa, Okla.

Fuel-oil heaters

Bulletin 200 outlines fuel-oil heaters for use on the suction side of a pump for heating viscous fluids such as Bunker C oils, asphalts, and other heavy liquids in order to reduce their viscosities, so they can be readily pumped. Two types of heaters are described. This eight-page bulletin also contains technical data on the heaters including materials and code, pressure-temperature ratings, heater lengths and sizes, shell-nozzle orientation and sizes, ordering instructions, tables of dimensions, and drawings. Source: **Brown Fintube Co.,** 300 Huron St., Elyria, Ohio.

Distillation equipment

Just released, this eight-page brochure details distillation equipment for the chemical, petroleum-chemical, and other process industries. A special section is devoted to distillation columns. Bulletin A-70 reviews the use and design of three principal types of trays—bubble cap, sieve, and valve. It includes a discussion, with illustrations and photos, of one-piece-tray construction, cartridge and sectional-type trays, sectional-tray designs, and conventional solvent stills. Source: **Struthers Wells Corp.,** Warren, Pa.

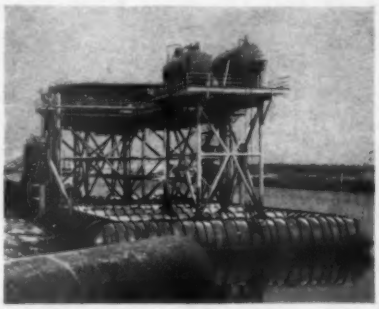
Dielectric-monitor models

This four-page bulletin details the Model TDM-X and TDM-10 dielectric monitors, said to combine a high degree of accuracy and stability with field-proved reliability and ease of servicing. The literature piece offers two pages of physical specifications and a breakdown of component parts. Included is a full page of information on the instruments' principle of operation. Source: **United Engineers, Inc.,** 2139 S. Sheridan, Tulsa, Okla.

Pioneer underwater crude storage tanks cut offshore crude storage and oil handling cost by approximately 50%

The world's first underwater storage tank which went into operation last year in the Gulf of Mexico near Eugene Island, has cut barge loading time to a mere 4 hours, with resultant savings in both operating and equipment costs.

The unit, which was floated into position and then submerged 30 feet, consists of tubular storage sections 209′ x 88′, cross sectional tubing and above surface platforms for working equipment and housing. Crude flows directly into the tanks from offshore wells.



World's first underwater storage tanks operated by Ocean Drilling & Exploration Company.

Keys to the success of this revolutionary installation include maximum utilization of space and speedy transfer of stocks.

How Stocks Are Transferred

Two Johnston vertical barge stripper-type pumps are used to transfer crude stocks directly from storage to barge. Each has a capacity of 1200 gpm or approximately 41,000 bpd. The pumps also handle seawater when required as some of the tanks are used to keep it on the bottom.

Pumping Features

The barge stripper-type pump selected has characteristics which make it most suitable for a transfer operation of this type. (See Fig. 1.) A multi-stage turbine bowl assembly is combined with a single stage propeller for maximum suction lift without vapor lock. A vent line with manually operated valve primes the suction lines and strips the compartments to their lowest practical level. An equalizer line, running from the turbine bowl unit to a point immediately above the propeller unit insures against possible vapor lock of the turbine impellers. The pump primes itself at low fluid levels through the action of the propeller booster. The entire pump assembly can be lifted from position for maintenance or repair without disturbing piping because of in-line construction. Surface space requirements, of course, are at a minimum.

Johnstons have been working for experienced oil operators in many ways for more than 50 years—in refineries, pipe lines, water supply, secondary recovery—and now in offshore. A trained field man will be glad to give you complete information or show how Johnston can best serve in *your* operation. Just call or write for an appointment.

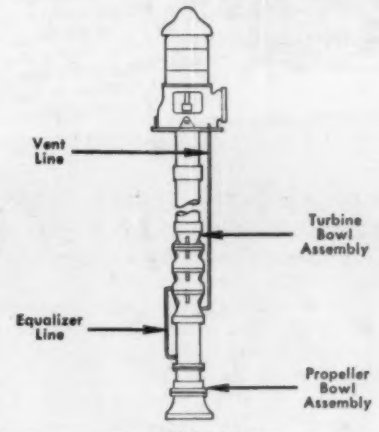


Fig. 1

JOHNSTON PUMP COMPANY

Main Factory: Pasadena, Calif., 3272 E. Foothill Blvd.; Phone: MU 1-7601

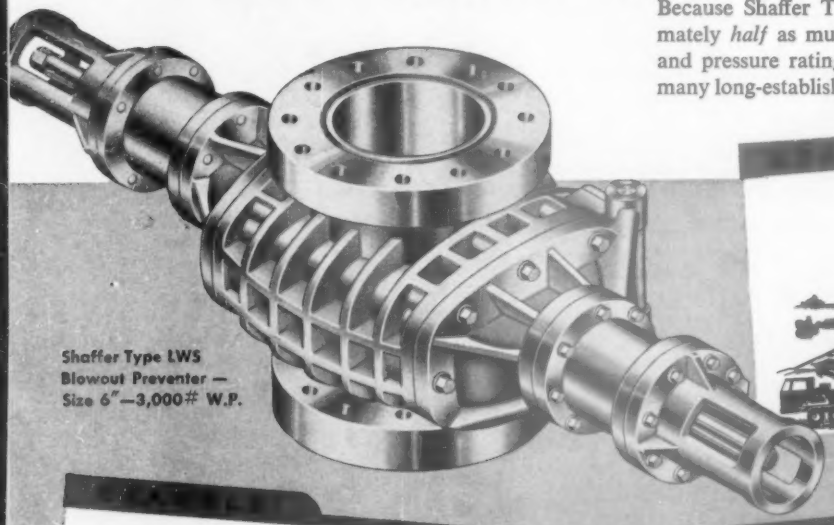
Branches: New York 20, N.Y., 30 Rockefeller Plaza; Phone: PL 7-0431 • **Atlanta 1, Georgia,** 57 Forsyth St., N.W.; Phone: JA 3-7395 • **San Francisco 8, Calif.,** 260 Kearny St.; Phone: EX 2-0338 • **Roswell, N.M.,** 2007 S.E. Main; Phone: MA 2-5942 • **Pecos, Texas,** Balmorhea Highway; Phone: HI 5-3022 • **Idaho Falls, Idaho,** South Yellowstone Hwy.; Phone: JA 2-8144

HALF THE WEIGHT...for Lower Shipping Costs!
HALF THE WEIGHT...for Easier Installation!
HALF THE WEIGHT...for Simplified Storage!

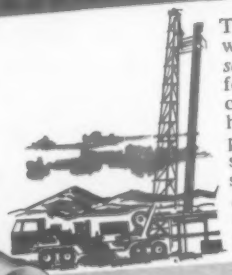
The Industry's First LIGHTWEIGHT Blowout Preventers

SHAFFER TYPE LWS BLOWOUT PREVENTERS

Because Shaffer Type LWS Blowout Preventers weigh approximately *half* as much as comparable equipment of the same size and pressure ratings, this Shaffer development is revolutionizing many long-established practices in the oil industry . . .



Shaffer Type LWS Blowout Preventer — Size 6"—3,000# W.P.



The 6"–3,000# W.P. Preventer weighs only 780 lbs. *(a 67% saving in weight)* and is ideal for protection on quick in-and-out production jobs where the heavy weight of other types of preventers make adequate pressure protection impractical on such operations. Result—*greater safety is now possible on all types of production and well rework jobs!*

On out-of-the-way rig sites where high transportation costs are a big problem, the 6"–5,000# W.P., 8"–3,000# W.P. and 10"–3,000# W.P. Type LWS Preventers with weight savings up to 64%, (see table below at right) are making possible major economies in shipping costs. Even on domestic wells, weight savings like these can mean the difference between using a big, costly truck or a small, inexpensive one—*plus additional savings in storage and handling costs all along the line!*

Even the large 10"–3,000# W.P. Type LWS Preventer can be readily transported, *fully assembled*, by normal air cargo and helicopter lifts, saving vital time and slicing costs in jungle or arctic operations where roads are non-existent or are so impassable during certain seasons that heavier types of preventers cannot be transported to the rig site. *But with LWS Preventers, losses in rig-up time are virtually eliminated!*

INCORPORATE THE LATEST SHAFFER ADVANCEMENTS—Although they are light in weight (made possible by a unique Shaffer "deep-rib" steel casting technique) Type LWS Preventers incorporate all the latest Shaffer advancements—advancements still not found on other preventers that weigh *twice* as much . . . **Swinging END-Opening Doors** for quick, simple ram changes without loss of operating fluid . . . **Positive "In-Line" Power Drive** with each ram and its operating piston on opposite ends of a *single* stainless steel shaft (no levers, yokes or other complex connections between the ram and its operating piston) . . . **Quick-Drain Ram Compartments** that prevent detrimental accumulation of mud and sand—*and many other important advancements found only in Shaffer Preventers!*

SEE your nearest Shaffer representative for complete data on the savings you can make with the *lightweight* Shaffer Type LWS Blowout Preventers. Or Write Direct!

FOUR POPULAR SIZES OF SHAFFER TYPE LWS BLOWOUT PREVENTERS

Nominal API Size	Working Pressure	Test Pressure	Vertical Bore	Approx. Weights		Approx. Saving in Weight*
				Single	Double	
6"—3,000# W.P. (6" Series 900)	3,000 PSI	6,000 PSI	7 1/16"	780 lbs.	1,420 lbs.	67%
6"—5,000# W.P. (6" Series 1500)	5,000 PSI	10,000 PSI	7 1/16"	1,410 lbs.	2,610 lbs.	55%
8"—3,000# W.P. (8" Series 900)	3,000 PSI	6,000 PSI	9"	1,100 lbs.	1,950 lbs.	64%
10"—3,000# W.P. (10" Series 900)	3,000 PSI	6,000 PSI	11"	2,100 lbs.	3,850 lbs.	45%

*As compared with comparable equipment now in use.

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EQUIPMENT MEN

Brine Service Specialties forms new division based in Houston

Established to provide pressure-testing services on product pipelines, the organization will be known as Pipeline Testing Division of Brine Service Specialties, Inc. According to W. D. (Bill) Schoolcraft, vice president, the latest equipment and methods will be employed to perform tests on new and existing lines.

Schoolcraft, who will head the new firm, was formerly a vice president of Fish Service Corp. and general pipeline superintendent for Brown & Root, Inc. He has a reputation for development of new techniques in offshore pipelining and for his supervision of construction on the Pacific Northwest pipeline and the more recent Argentina pipeline.

Southwest Industries appointed

... exclusive distributor for a line of turbocharger equipment manufactured by AiResearch Industrial Division of Garrett Corp. As distributor, Southwest will handle all sales and installation of AiResearch turbochargers for two-cycle natural-gas engines in an area which includes Texas, New Mexico, Colorado, Nebraska, Kansas, Oklahoma, Louisiana, Mississippi, Alabama, Arkansas, Missouri, and Illinois.

Richard F. Schuster appointed

R. F. Schuster

... advertising and sales promotion manager of Owatonna Tool Co., replacing Kyle Peterson, who joined Erwin Wasey, Ruthrauff & Ryan advertising agency. The announcement comes from J. A. Mullenmaster, vice president and director of sales for the Owatonna, Minn. company. Schuster has previous advertising experience with National Tea Co. and several newspapers. For the past 3 years he served as assistant OTC advertising manager.

Well Equipment Mfg. Corp. adds pair to sales and service staff

William G. Meinecke and H. M. Williams have joined the sales and service staff of this Houston manufacturer, according to John W. Gates, vice president and sales manager. Meinecke will headquarter in Hobbs, serving New Mexico and the western part of the Texas Panhandle. He has been in Hobbs the past 3 years as geologist for Darrell

W. G. Meinecke

H M. Williams

W. Smith Co. As representative, Meinecke will handle WECO unions and compounds, Hamer-line blind valves and plug valves, and Chiksan swivel joints.

Williams, for the past 6 years a steel warehouse sales representative in the Houston area, will be assigned to WECO's industrial sales. He will headquarter at the company's home office, from where he will serve Houston and its trade area, including the upper Gulf Coast of Texas. In addition to WECO products, Williams will also handle the complete lines of Chiksan and Hamer products.

Go-Jet Services, Inc. adds Bob Altenreid to sales staff

Altenreid will work as a sales representative, according to Larry Drake, board chairman of Go-Jet. Altenreid was formerly a sales representative for Magnet Cove Barium Corp., vice president of sales for Chris Well Servicing Co., Ltd., and co-owner of Maverick Construction Co.

Go-Jet Services, with offices in Pauls Valley, Shawnee, Enid, Oklahoma City, and Liberal, Kans., is a wire - line - service company doing gamma - neutron logging, temperature logging, cement-bond logging, and perforating. Research facilities are in Fort Worth.

H. E. Collins named director of licensee manufacturing services

H. E. Collins

In his new position with Hughes Tool Co., Collins will assist W. H. Siems, vice president of sales, in coordinating the company's licensee operations. He will act as technical consultant to the companies licensed to manufacture Hughes products, and work with these manufacturers in setting up training programs and designing and constructing plants and special equipment.

Collins joined Hughes in 1919. He has served as tool-room foreman, plant superintendent, manager of the planning department, and manager of process engineering. Prior to his present appointment, he served as manager of overseas manufacturing.

Two promotions at Gates Rubber

Stan Johnson will become director of advertising and Robert E. Holwell has been named manager of Gates dealer tire sales. Holwell, director of advertising since 1959, has been with Gates since 1946. Johnson has been with the rubber company 20 years.

Ralph Smith named director and vice president of Dowell Div.

R. H. Smith

The appointment was announced by A. C. Polk, executive vice president and general manager of Dowell Division of the Dow Chemical Co. Smith joined Dowell in 1944 as district engineer at Houston. He became manager of the Houston district and, in 1950, transferred to Midland as manager for the West Texas district. Since 1953 he has been director of sales. Prior to joining Dowell, Smith served for several years in various engineering capacities with Stanolind Oil & Gas Co. in the Houston area.

Milton Roy makes 3 changes

H. Rodman Smith has been promoted to sales manager of Milton Roy's Instrument Division. In the Mechanical Products Division, A. W. Lubbers and John A. Mitchell, Jr. have been appointed sales manager and assistant sales manager, respectively.

Smith will be responsible for the sale of all Milton instruments in the United States and its possessions. He joined the company in 1952 as an application engineer and was later promoted to chief application engineer. In 1957, as assistant general sales manager, he assumed responsibility for directing several phases of the company's marketing activities.

Lubbers and Mitchell will handle the sale of Milton Roy mechanical products and accessories. Lubbers is president of Chemical Pump & Equipment Corp., of New York City, a subsidiary of Milton Roy. Since the acquisition of that corporation last January, he has also acted as Milton Roy's regional sales manager for the northeastern states. Mitchell was assistant to Milton Roy's President Robert T. Sheen from 1955 to 1957. More recently he was regional sales manager.

J. B. Gibson named district sales manager in Houston

. . . for Jones & Laughlin Steel Corp., it was announced by John E. Timberlake, vice president of sales. Gibson was formerly assistant manager of tubular products sales in the company's home office in Pittsburgh. His responsibilities include supervision of sales offices in Dallas and Midland, and his territory takes in the states of Texas and New Mexico.

J. B. Gibson

Sales supervisor for LACT appointed by J&L Supply

J. A. Bailey

James A. Bailey assumes the title of sales supervisor — LACT, in the production-equipment - sales section of Jones & Laughlin Supply Division, Tulsa, according to Bill Wood, general manager of sales. Bailey's duties will be to promote sales and supervise service of J&L LACT equipment. He joined the division in the general products sales department, Tulsa office, in 1959, and became regional salesman for production equipment at Midland last year.

Milwhite Mud Sales Co. shifts Neal Shults to Dallas

. . . to serve as a representative. Shults has been associated with Milwhite and Wilwhite products since 1955, having worked for Basin Mud Co., a Milwhite distributor, in Midland. In 1957 Milwhite purchased Basin Mud and Shults continued to serve as business manager and in sales capacities.

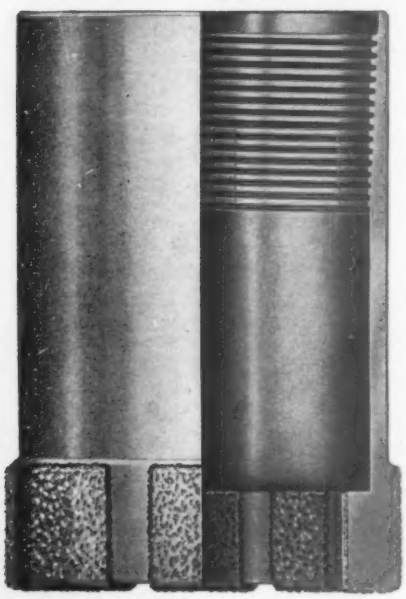
Neal Shults

At the same time, Milwhite an-

A Tremendous Advancement In Milling Stuck Fish

THE GLOBALOY MILL SHOE

An Indispensable Accessory to the GLOBE JUNK BASKET



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For Fast, Safe, Economical Milling of All Types of Junk During Fishing Operations

Designed for milling stuck fish in conjunction with the world famous GLOBE JUNK BASKET for fast, dependable recovery of all the loose pieces in the hole, THE GLOBALOY MILL SHOE is the ideal tool for milling a wide variety of junk in a fraction of the time required by conventional shoes.

THE GLOBALOY MILL SHOE represents a metallurgical milestone in safe, fast, economical, rough abrasive milling operations. An exclusive product of Globe Oil Tools Company, GLOBALOY consists of sintered tungsten carbide particles which are applied to Mill Shoes by a special binding process which suspends the carbide particles in a strong mold. An infinite number of sintered cutting particles support all sides of the GLOBALOY MILL SHOE to provide continuous self-sharpening no matter how difficult the milling job. When one cutting edge dulls, another takes over until the entire matrix is exhausted. GLOBALOY MILL SHOES cut faster, require fewer round trips and provide greater economy and safety. A complete range of sizes.

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GLOBE OIL TOOLS CO.

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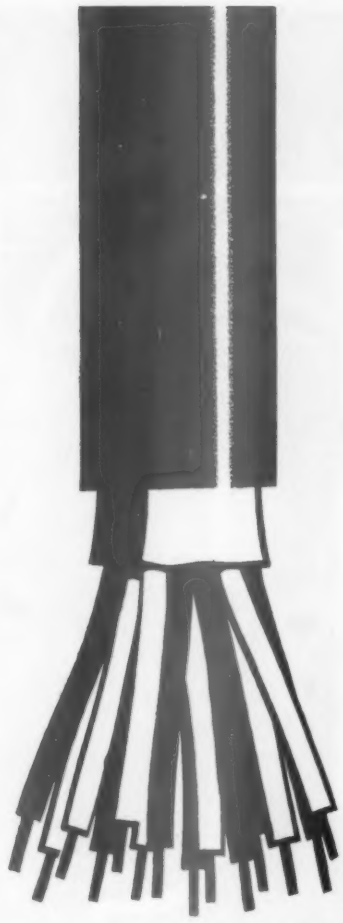
Branches Maintained in All Principal Drilling Areas



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Honeywell

First in Control

SINCE 1906

nounced that Asa Cezeaux, former division engineer for the Texas Gulf Coast, left the company to become vice president of Spindletop Mud Co., Milwhite dealer in Beaumont.

Guiberson names new managers

D. L. McGill

Robert L. Boyd, Guiberson president, announces the appointment of Dennis L. McGill as manager of advertising; Dale E. Johnson as manager of exports; and Jack W. Edwards as manager of purchasing. McGill joined Guiberson in 1939. He entered the sales and advertising department in 1949 as supervisor of advertising and oil heater sales. Johnson just recently joined the company. Previously he was director of sales for Europe, Asia, and Africa for Camco, Inc., of Houston. Prior to joining Guiberson in 1946, Edwards was with North American Aviation, Inc., in the material control and purchasing division.

D. E. Johnson

J. W. Edwards

A. H. Widowit, Jr. is ad manager at Universal Oil Products Co.

A. H. Widowit, Jr.

Widowit will be responsible for the company's advertising programs including planning, scheduling, media selection, promotional materials, exhibits, and advertising - agency relations. In addition, he will cooperate with UOP subsidiary companies in their advertising programs. Since joining the company 3 years ago, Widowit has been advertising assistant to Harvey W. Blackenship UOP's director of public relations.

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use Dow Corning Silicone Defoamers*

There's a *right* tool for every job. In foam control it's Dow Corning silicone antifoamers or defoamers . . . job-proved thousands of times over as the most efficient, most economical, and most versatile foam suppressors available.

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and new manual on foam control

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Please rush a FREE SAMPLE of a Dow Corning silicone defoamer for my product or process, which is (indicate if food, aqueous, oil or other): _____

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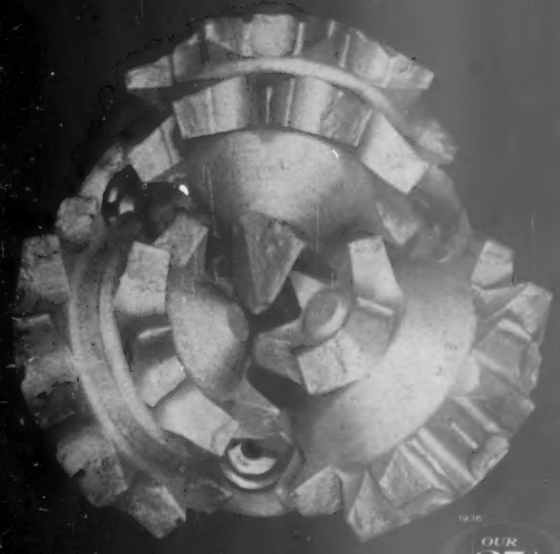
DT

Designed for Soft Formations

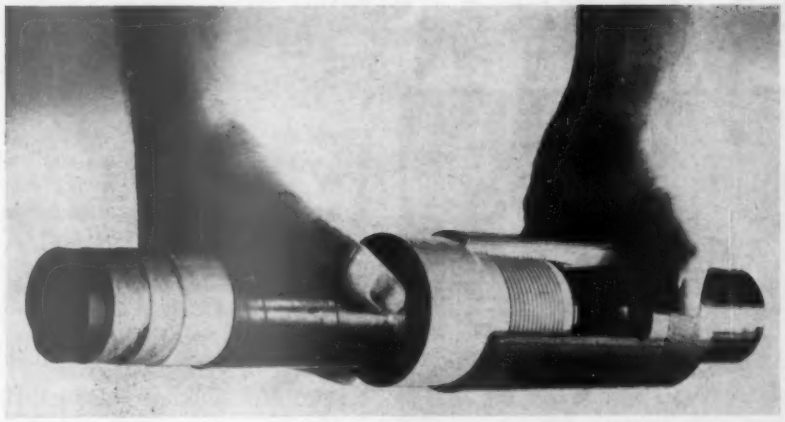


SMITH TYPE DT 3-cutter rock bits are designed and constructed to insure rapid rates of penetration in moderately soft to soft formations . . . sturdy, deeply cut and widely-spaced teeth . . . optimum self-cleaning properties are provided by the widely-spaced teeth in combination with ample tooth deletions and efficient flushing action of the circulating fluid.

1936 OUR 25th YEAR 1961

Smith TOOL CO.

COMPTON, CALIFORNIA
Branches in Principal Oil Centers Throughout the World



CUTAWAY VIEW of Spiral-Glass pipe (from right) shows construction is: factory-applied thread section, stronger joint strength than pipe itself; blended nitrile rubber (ABR) and polyvinyl chloride (PVC) cover; filament-wound glass-fiber-reinforced core sections; and combination ABR-PVC liner.

New plastic pipe for petroleum use

A NEW plastic pipe designed for extreme pressure and temperature applications in petroleum production has been announced by the Spiral-Glas Pipe Co. of Old Bridge, N. J. Presently geared to producing 2-in. pipe for 500-psi. service, Spiral-Glas plans to be in full-scale continuous production of 2-in. 3-in. and 4-in. pipe by June 1962.

The pipe is designed for use in corrosive applications at high pressures and is recommended for use in crude gathering lines, salt water disposal lines and water-flooding operations. As downhole tubing, it may be used in salt water disposal wells and combination injection and disposal wells.

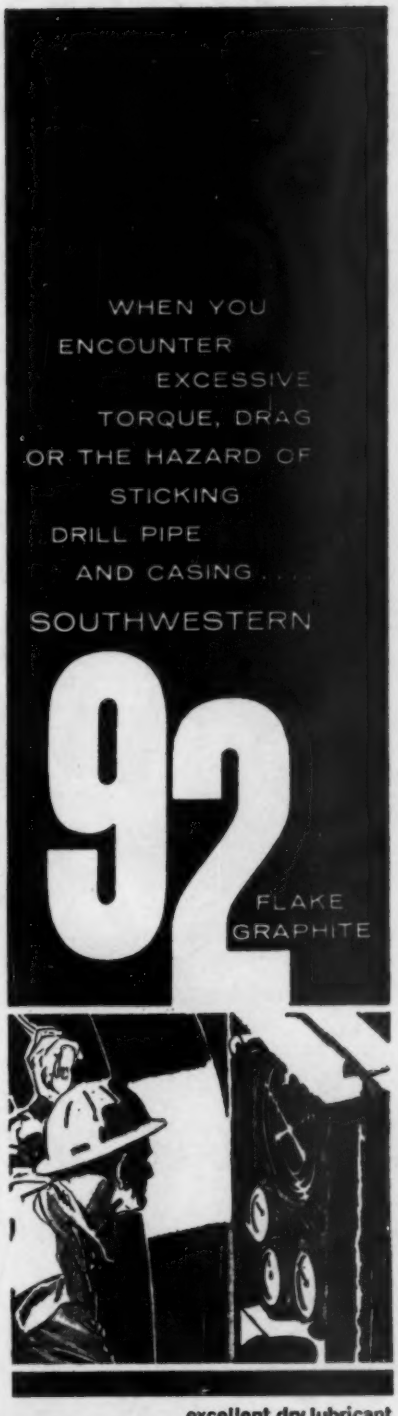
According to Carl de Ganahl, president of Spiral-Glas, the pipe's unique design and material formulation give it superior performance characteristics. Structure consists of a glass-fiber-reinforced core cocured with and protected by a specially formulated liner and cover. The high-strength glass fibers are chemically linked with a plastic matrix based on Enjay Chemical Co.'s Buton A-500 resin.

Filament winding adds to strength. The core of the plastic pipe is of filament-wound structure, according to de Ganahl, increases strength properties of the pipe considerably over conventional fiber-reinforced pipe. Enjay's all-hydrocarbon thermosetting resin, highly hydrophobic in nature, prevents water absorption by the pipe wall, thus prolonging its life.

The present pipe has a maximum operating pressure of 500 psi. at 80° F. The maximum operating temperature is 250° F. Design yield strength of this pipe is at 4,000 psi. Actual tests reveal burst pressures as high as 5,800 psi., showing hoop tensile strength of the filament-wound structure to be 100,000 psi. Pipe for 1,500-psi. working pressures will be available in the near future.

Liner and cover also extend life. Cover and liner of the pipe are made of a blend of nitrile rubber and polyvinyl chloride (ABR-PVC). Cocured with the reinforced core, they provide the pipe with abrasion resistance, protection against erosion and oil and chemical resistance. In adidtion, the ABR-PVC liner, combined with the insulating value of the glass-reinforced Enjay Buton A-500 resin core should give this pipe a greater resistance to paraffin deposition.

Another outstanding advantage offered by the Spiral-Glas pipe is its resistance to high pressure and handling damage. It will not "weep," as does pipe lined with brittle resin, in which cracks often develop due to rough handling or accidental operation at excessive pressures. To



excellent dry lubricant • inert • compatible with any mud • mud rheology unaffected • mixes readily • inexpensive • minimum graphitic carbon 92% • durable, weather-resistant 50-lb. bags

SOUTHWESTERN GRAPHITE COMPANY

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In Canada
"The Bank" is Toronto-Dominion

Oil interests in the United States wanting to do business north of the border find a "well" of sound information and guidance when they go to the bank that *knows* Canadian business.

For a Free up-to-date detailed map of the Western Canadian oil and natural gas fields and pipelines, PLUS a brochure entitled "The Canadian Petroleum Industry—Achievements and Prospects," write

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date, chemical tests have shown the pipe to be suitable for the following services at 200° F.: crude oil, kerosine, diesel fuel, JP-4 jet fuel, and brine.

The ABR-PVC cover also provides the pipe with good sunlight resistance and increases its service life in outdoor and buried applications, precluding the need for pipe wrap or maintenance operations, such as painting.

Connections Designed to Prevent Leakage

The firm is now supplying the pipe in 20-ft. lengths with factory-applied male and female API EUE 8 rd. threads at either end. The liner of the pipe is wrapped over the pipe end and is sealed under the molded thread. An oil and chemical resistant "O" ring permanently set on the tip of the male thread insures a high-pressure leak-free seal. Joint strength is higher than that of the pipe itself.

Cost is competitive with other corrosion-resistant pipes. The new pipe compares favorably on a long-term economic life basis with corrosion-protected steel, alloy steel, and other thermosetting plastic pipe. Thermosetting plastics, as opposed to thermoplastics, are those that set or harden under heat to a permanent shape. Spiral-Glas also offers another highly chemical-resistant lining material for other than hydrocarbon applications.

Active fields annual drilling report ready

IN THIS, the annual drilling number, the Journal presents a special annual report which may be of equal interest to contractors and operators.

Nearly 200 firms were polled to determine some of the most active drilling fields. The response was exceptionally good.

In a couple of rare instances where a single operator controlled the activity of a field, no data were submitted. The operator was reluctant to submit any information and this policy is understood.

It is hoped that the reader will derive benefit from this year's edition. For you back-to-front readers, the report starts on page 148.

"Low maintenance cost sold us on Edward Mudwonder Valves,"

says Jess L. Warton,
Warton Drilling Co.,
Odessa, Texas

"Everybody knows that drilling contracting can be a tough business. And, those of us who make a living at it would be the first to say so. Yet, the difference between success and failure is often a very subtle matter.

"In my experience, making a go of it hinges largely on having plenty of know-how and experience in drilling, plus first-class rigs and other equipment, plus well-trained crews and tool pushers. Men and equipment have to be tops, and they must also work well together.

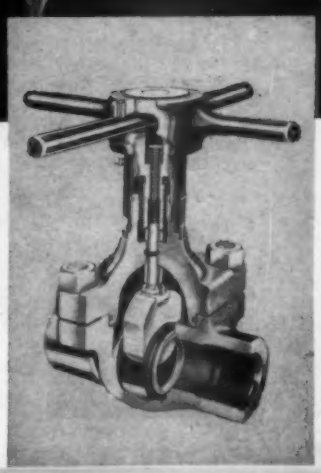
"For example, a successful drilling contractor has to be especially careful about selecting engines, pumps, valves, drill bits and other operating gear. The difference between best and next-to-best is the difference between a profit and no profit. Mud valves are a case in point.

"We found that Edward Mudwonders required less maintenance than the others. We now follow a program of switching to Mudwonders whenever other mud valves wear out and require more and more maintenance."

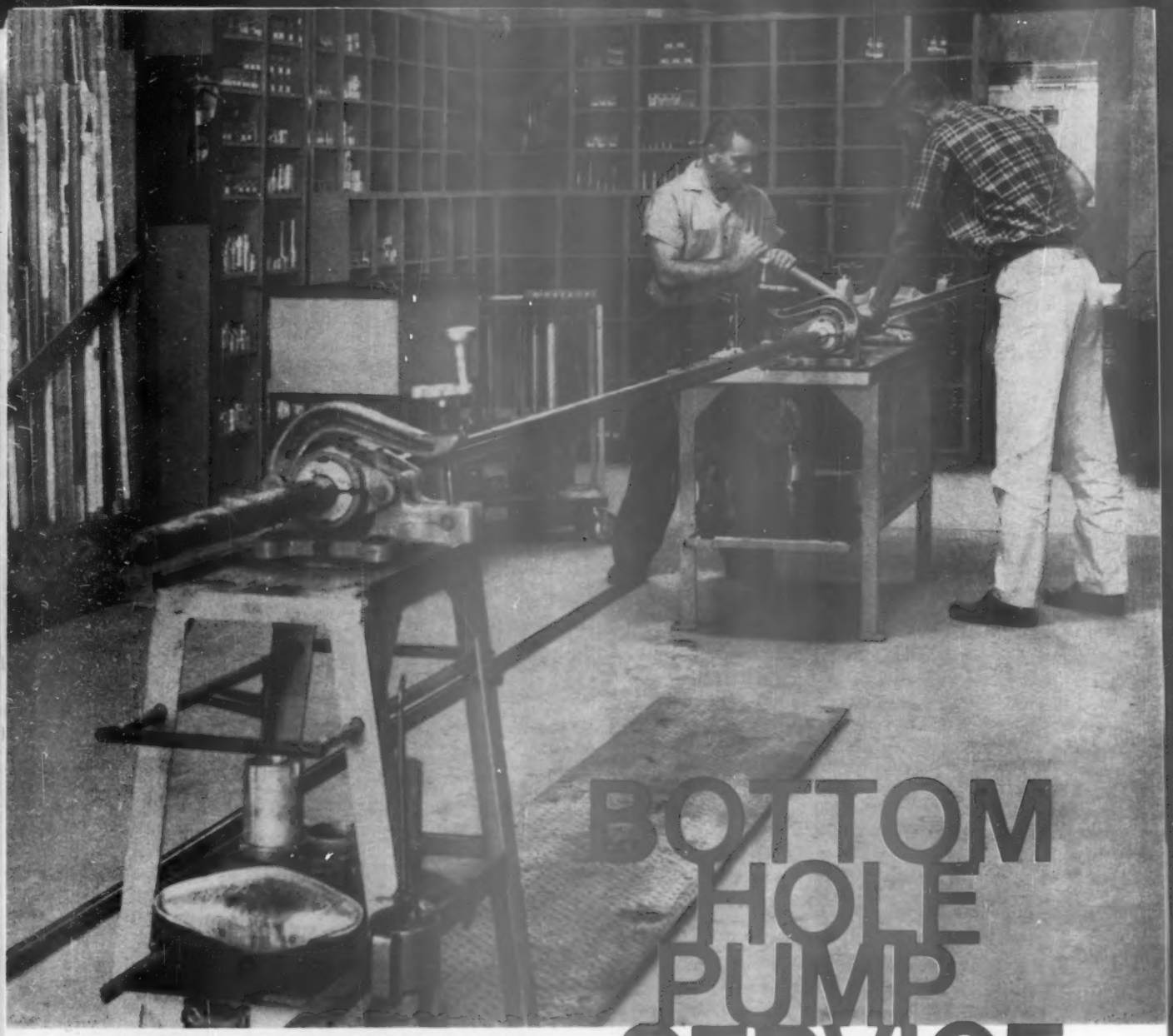
For additional information on Edward Mudwonder valves, see your favorite oil field supply store, or write Edward Valves, Inc., 1212 W. 145th Street, East Chicago, Indiana. Subsidiary of Rockwell Manufacturing Company.

EDWARD STEEL VALVES
another fine product by
ROCKWELL

Jess L. Warton, Owner, Warton Drilling Company, shown at Rig #3 on lease near Andrews, Texas.



Mudwonder cut-away view shows the one-piece seat insert with Buna-N molded integrally over steel wear rings; chrome gate with "T" slot connection; separated stainless stem and double thread construction.



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MID-CONTINENT PROVIDES FAST...EFFICIENT...

Repair and maintenance of subsurface, plunger type pumps is handled by Mid-Continent through an expanding system of pump shops. Each shop is operated by personnel who are trained and experienced in repairing all makes of pumps. Tools and facilities are available along with complete stocks of parts to handle all types of maintenance and repairs. Pumps are cleaned and inspected, worn parts are replaced, and then reassembled and tested. After being repaired, pumps are greased, painted and protected with a dustproof, waterproof ordnance wrap. They can then be delivered to the field for immediate use, or safely stored until needed. To keep your pumps operating in top condition, call Mid-Continent for factory-type pump repair.

UP1-1

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Texas offshore drillers try, try again

BY FRANK J. GARDNER

AT LEAST SIX DEEP WILDCATS are drilling in federal waters off Texas today. The rewards of this search so far are nil, but offshore drillers still believe that the undiscovered oil is there.

THE MAP ON THIS PAGE is a study in frustration. It's a black answer to the white hopes of Texas Gulf Coast operators, who, 10 years ago, envisioned an offshore belt of oil and gas fields every bit as lush as the onshore belt.

Why this situation? Nobody knows. Yet. Even the most astute coastal geologist can't explain it. The structures are there. The sands are there; though not in as great abundance as onshore. But the oil and gas are AWOL.

A gold-plated campaign. True, some small pools have been found, as the map shows. But after spending more than $100 million in the federal gulf waters, the offshore driller has yet to find "another Spindletop."

Yet, he keeps trying. Today, two deep wildcats are at or near total depth, and four are drilling or set to go soon.

Perhaps the most intrepid hunter in the Texas offshore province is Shell Oil Co. That company has paid nearly $30 million for 230,000 acres of federal leases and has drilled a dozen deep wildcats; of these, one, in Block 160-L, made a subcommercial gas well a few months ago. Hardly a profitable hunt! But today you'll find three Shell wildcats on the scout books—one in Block 160-L, one in Block 328-L, and another in Block 288-L (see map).

Farther from shore than Shell is a Pan American Petroleum Corp. salt-water wildcat. Pan Am's 1 Block 389-L lies 40 miles southeast of Freeport. It has reached contract depth of 13,000 ft., but no dope is yet released on the well.

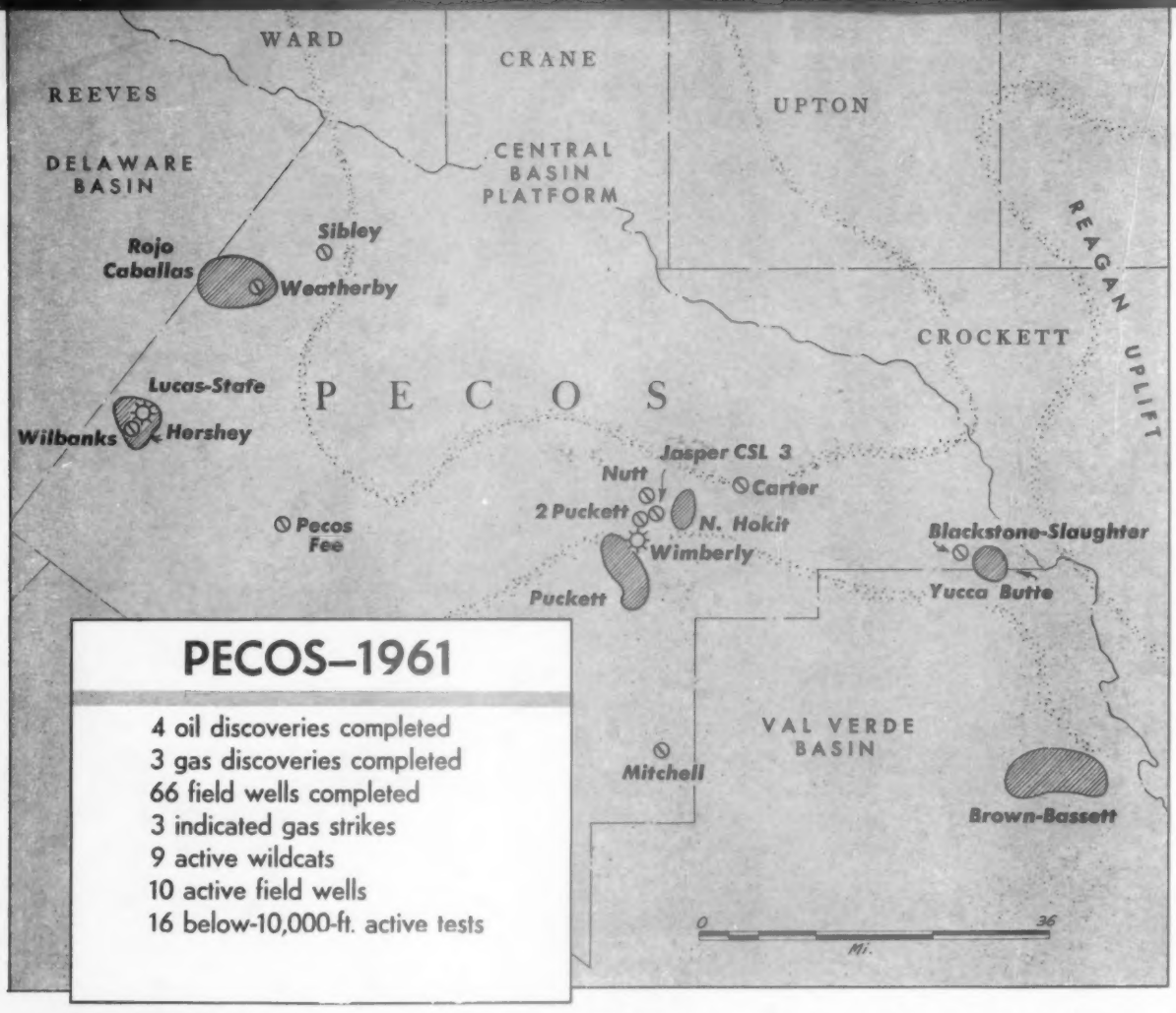
In Block 140-L, Standard Oil Co. of Texas has an 11,000-ft. operation at the 4 Federal 140. This was to go to 11,000 ft. and is also a tight hole.

In the lower coast off Corpus Christi, only one gulf wildcat is listed. But an interesting one it is. Socony Mobil Oil Co., Inc. 1 State Lease 53154, on Federal Block 859-L, is slated to 12,000 ft. Lying in the northwest quarter of the block, it's only 1,980 ft. south and 2,320 ft. east of a deep duster drilled last spring by Tennessee Gas Transmission Co. That wildcat stopped at 12,448 ft.

Obviously, Socony believes it has something in this prospect, and it could be a very significant operation for the Kleberg County tidelands.

May go on for years. As seen on the map, the slight successes off Texas lie in two clusters. One is off Corpus Christi, the other off Galveston. In between, nothing. There's still plenty of room to play between Brownsville and Port Arthur.

But it's strictly a blue-chip play. We may see yet another hundred million poured into dry holes before the riddle of Texas' offshore pays off in oil. Meanwhile, frustration reigns.



IN A DEEP AND SLOW WAY, West Texas' Delaware basin, Pecos country, is joining the list of gas majors. Gas hunters are keeping a close eye on this troublesome and expensive wildcat theater.

Gas is deep, hard to find, but Pecos operators speed up hunt

Pecos County's deep production record has come a long way since Puckett. Many thought Puckett's 15,000-ft. pay would be as far as Texans could go, but that record soon gave way to 16,680-ft. gas at Hershey. We should see this record challenged very soon.

THERE ARE MORE deep wildcats going in Pecos County than in any other section of West Texas. This deep wildcatting and development campaign centers around Rojo Caballos, Hershey, Yucca Butte, Puckett, and North Hokit fields. To add to the growing interest in the southeastern corner of Delaware basin and in the channel area leading into Val Verde basin are two wildcats located far from any production, deep or shallow.

BY JOHN C. McCASLIN
Geological Editor

The year's score. So far this year four new oil pools have been tapped officially in Pecos County, and three new gas fields are on the register. But at this writing there are 3 more indicated gas strikes, 9 active deep wildcats, and 7 below 10,000-ft. active field wells.

Pecos gas discoveries are popping up in far-removed places. Gas seems to be the prize catch in this expensive drilling arena where three wells at Rojo Caballos cost more than $5 million. The discovery well here was Mobil Oil Co. 1 Kathleen Moore. This big Pennsylvanian strike flowed 102 M.M.c.f.d. from perforations at 15,041-47 ft. The 1 Fred Schlosser, 1¼ miles southwest, flowed its gas from about 16,400 ft. The third well in the field is the 1 Ida B. Weatherby. It had open-

Below-10,000-ft. Pecos County wildcats currently active are:

1. Hassie Hunt Trust 2 Dow Puckett, 10,800-ft. test in Sec. 1, Blk. 100, EL&RR Sur., 25 miles southeast of Fort Stockton. Drilling below 5,642 ft.

2. Hassie Hunt Trust 1 Fred Nutt, 11,000-ft. test in Sec. 1, Blk. 180½, TCRR Sur., 26 miles southeast of Fort Stockton, 1 mile northeast of 2 Wimberly. Drilling below 7,086 ft.

3. Hassie Hunt Trust 2 H. A. Wimberly, 11,000-ft. test in Sec. 42, Blk. 100, EL&RR Sur., 23 miles southeast of Fort Stockton, 4½ miles northeast of Puckett field, 4 miles southwest of Ellenburger gas discovery. Completed September flowing CAOF M.c.f.d. Ellenburger 10,480-10,535 ft.

4. Pan American-Western Natural Gas Co. 1 N. M. Mitchell, 15,500-ft. test in Sec. 103, Blk. 3, CCSD&RGNG Sur., 18 miles north of Sanderson, 16 miles southeast of Puckett field in remote and far-from-production region. Drilling below 10,423 ft.

5. Mobil Oil Co. 1 Effie Potts Sibley, 17,000-ft. test in Sec. 48, Blk. OW, TTRR Sur., 22 miles northwest of Fort Stockton, 1¼ miles northeast of Coyanosa lower field. Well blew out and caught fire in September. Fire was one of worst on record casualty-wise. Gas flowed from Wolfcamp Permian at 9,494-9,512 ft. Well killed September 14.

6. Mobil 1 Ida Weatherby, 20,000-ft. test in Sec. 20, Blk. 48, T-8, T&P Sur., 20 miles northwest of Fort Stockton, 1 mile east of 1 Moore discovery. Completed flowing 3,384 M.c.f.d., 11 bbl. condensate per million from Pennsylvanian below 13,122 ft.

7. Southern Minerals Corp.-General Crude Oil Co.-Continental Oil Co. 3 Jasper CSL, 11,000-ft. test in Sec. 1, Blk. 104, 29 miles southeast of Fort Stockton, 7,899 ft. northwest of 1 Jasper CSL (Clearfork and Canyon discovery). Drilling below 2,840 ft.

8. Tidewater Oil Co. 1 Mary McKenzie Carter, 10,000-ft. test in Sec. 12, Blk. 604, GC&SF Sur., 16 miles southeast of Girvin, 2 miles southeast of Cardinal field. Drilling below 1,550 ft.

9. TXL Oil Corp. 1 Pecos Fee, 18,500-ft. test in Sec. 137, Blk. 3, T&P Sur., 17 miles southwest of Fort Stockton, no nearby production, 8 miles southwest of Belding field (shallow). Tested shows in Devonian at 14,575-14,717 ft. TD 14,965 ft. Milling at 14,965 ft.

Deep field wells include:

1. Atlantic Refining Co. 1 Gallaher Estate, Hershey Multipay field, 17,200-ft. test in Sec. 9, Blk. 51, T-10, T&P Sur., 31 miles west of Fort Stockton. Drilling below 14,888 ft.

2. Atlantic 1 Elizabeth Louis-State, Hershey field, deep try in Sec. 18, Blk. 50, T-10, T&P Sur., 30 miles west of Fort Stockton. Drilling below 11,335 ft.

3. Gulf 1 R. B. Cross et al., Rojo Caballos Pennsylvanian field, 16,300-ft. test in Sec. 21, Blk 48, T-8, T&P Sur., 22 miles northwest of Fort Stockton, 1½ miles east of field discovery well. Drilling.

4. Humble 1 Blackstone-Slaughter, Yucca-Butter field, 10,200-ft. test in Sec. 26, Blk. A-2, TCRR Cur., 6 miles northwest of Sheffield field. Drilling below 4,286 ft.

5. Odessa Natural Gas Co. et al. 1 Wilbanks, Hershey field, 17,500-ft. test in Sec. 19, Blk 50-T-10, T&P Sur., 15 miles west of Fort Stockton. Flowed 3 M.M.c.f.d on 1-in choke, open hole 13,102-15,427 ft. in Wolfcamp and Pennsylvanian. TD 15,427 ft. WOPT.

6. Mobil 1 State-McIntyre unit, Rojo Caballos field, 16,200-ft. test in Sec. 30, Blk. 48, T-8, T&P Sur., 22 miles northwest of Fort Stockton. Drilling below 4,411 ft.

7. Standard Oil Co. of Texas 2-D Mitchell-Thomas unit 2, Puckett Devonian field, 12,500-ft. test in Sec. 33, Blk. 100, ELRR Sur., 25 miles southwest of Bakersfield. TD 12,240 ft. Testing in Montoya below 11,955 ft.

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flow potentials of from 30 to 50 M.M.c.f.d.

Hershey field. Atlantic Refining Co. 1 Kelly opened this field 31 miles west of Fort Stockton in Section 8, Block 51, T-10, T&P Survey. The well opened gas pay in the Devonian, Fusselman, Silurian, and Montoya Ordovician. Initial potential, calculated absolute open flow, was 52,500 M.c.f.d. from perforations at 15,831-16,680 ft., giving Texas its deepest production. Outside South Louisiana, this is the deepest producer anywhere.

Yucca Butte. Shell Oil Co. and Humble Oil & Refining Co. opened this field 6 miles west of Sheffield at 1 Blackstone-Slaughter. Potential was for more than 30 M.M.c.f.d. from Ellenburger Cambro - Ordovician, Connell Simpson Ordovician, and Pennsylvanian Detrital between 9,993-10,092 ft.

North Hokit. Southern Minerals Corp. and General Crude Oil Co. et al. 1-A Jasper CSL opened this area 30 miles southeast of Fort Stockton in Section 1, Block 104, Jasper CSL Survey, 2 miles northeast of Canyon production. The well flowed 12,300 M.c.f.d. from Ellenburger open hole pay at 10,399 ft.

Troubles. The Kathleen Moore discovery well had lots of trouble before completion. Even a normal hole at Rojo Caballos is expected to cost about $1 million due to hard rock, severe lost circulation, and terrific pressures. One of the costliest blowouts and fires yet in the industry is causing plenty of trouble at Mobil's 1 Sibley, northeast of Coyanosa field. Life and property loss was terrific. Field development in all of these ultradeep Pecos County discovery areas will be slow due to high drilling costs and abnormal drilling conditions. Rojo Caballos to date indicates a possible producing area of about 30 sections. Structure appears to be a dome-shaped anticline with 1,200 ft. of closure.

Gas is the prime target in Pecos County's deep splurge. There are plenty of problems, but all agree there should be plenty of gas in this part of the Delaware basin. It will take lots of deep drilling and lots of money. A couple of years ago the only deep gas out there was at Puckett with its 15,000-ft. Ellenburger pay. Four more deep gas fields have been added since then. The advance is slow, but the gains are excellent. Each new deep gasser in Pecos brings the Delaware basin another long step toward becoming a major new gas province. Of all the new gas basins in the country—Arkoma, Anadarko, Sacramento—the deep and troublesome Delaware has the longest way yet to go.

San Antonio bay test completed as oil well

OIL production has been opened in a wildcat discovery by Tidewater Oil Co. in the middle of San Antonio Bay, Texas' central coastal district.

The discovery is about 2 miles west of the Panther Reef gas area, and about midway between it and a wildcat gas-discovery well completed last November.

Tidewater's discovery well, 1 Texas State, in Tract 95, tested for 63 bbl. of 44.6°-gravity oil, flowing through 10/64-in. choke under pressure of 800 psi.

Its pay zone is perforated at 10,916-23 ft.

Location is 10 miles southeast of Austwell, on the Refugio County side, and about the same distance southwest of Seadrift, on the Calhoun County side.

EXPLORATION OUTLOOK

Another Anadarko pot is simmering in Oklahoma

BLAINE COUNTY, western Oklahoma, is rapidly taking its place among the busy areas of the Anadarko basin. Long bypassed by the oil and gas hunters who roamed through Ellis, Major, Harper, Woodward, Woods, and Kingfisher counties, Blaine County now has six official producing areas, three new discoveries this year, five new field-well completions, and seven active locations.

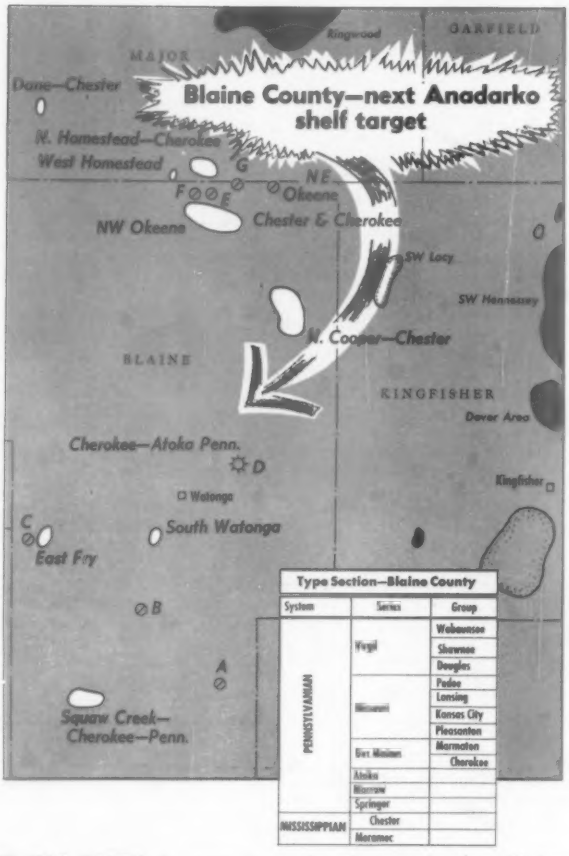
Directly on trend, Blaine County's new producing areas show a possible extension of the Mississippian and Pennsylvanian oil and gas reservoirs that have popped up in the past 5 years from Beaver County in the Panhandle southeastward along the edge of the northern shelf of the Anadarko basin. Most of the county's production is from rocks of Chester Mississippian and Cherokee Pennsylvanian age.

Most of the fields produce gas and gas-condensate. The biggest development so far has been along the northern edge of the county bordering Major County. Recent field work has linked North Homestead field of Major County with the Northwest Okeene sector of Blaine County. Discoveries have been completed in Sections 29-20n-11w at North Homestead, 32-20n-10w at Northeast Okeene, and in 35-20n-12w at West Homestead.

A void may be filled in an eight-township blank in the central part of Blaine. Texaco Inc. has a very important discovery at 1 Swanegan northeast of Watonga in C SE NE 11-16n-11w. (D on map). Before shutting in, the well flowed 5,400 M.c.f.d. and 62 bbl. condensate per day on 12/64-in. choke from what is believed to be Cherokee Pennsylvanian at 9,030-77 ft.

Nearest production lies 8 miles southwest at South Watonga field. North Cooper field lies 11 miles northeast. This Texaco strike also helps to fill in the void between prolific Kingfisher to the east and Custer City field far to the west.

On the steep shelf flank, Blaine County didn't have production of any kind until 1957 when North Cooper field was tapped. This was followed by Northwest Okeene, Squaw Creek, and others. Since 1959 activity has been almost nil in the county until the Homestead development to the north in Major County suggested to Oklahoma operators that they should take another look at Blaine's possibilities. Blaine's location on the steep side of the flank of the northern shelf of Anadarko should offer unlimited stratigraphic trap possibilities.



IT HAS TAKEN 3 years to make the grade, but Blaine County now is a center of wildcat enthusiasm.

Interest in Texaco's discovery south of most activity has already begun to show up on the drilling reports. Sunray Mid-Continent Oil Co. is drilling at 1 McNeeley-Fahl (A on map), Texaco 1 Ruth at B on map, Texaco 1 Baier-Boelen Unit at C on map, Pan American 1 Blankenship Unit at E on map, Pan Am 1 Strader Unit and 1 Reames Unit "B," F and G on map. Blaine County is about where Ellis County was 9 years ago as far as production and exploration go. Ellis had a slow start, but now is still going strong 20-some fields later. Blaine should be giving Kingfisher County a news-run for its money in the coming months.

—John C. McCaslin.

Strawn oil flows on tests at New Mexico confirmation

A 12,700-ft. wildcat in southwestern Lea County, Southeast New Mexico, 13 miles south of Maljamar, flowed oil on a drill-stem test in the Strawn Pennsylvanian and is drilling ahead below 11,360 ft. in lime and shale. The well is El Paso Natural Gas Co. 3 Lusk Deep unit in 20-19s-32e.

The test at 11,280-11,322 ft. got 120 bbl. of oil per hour on ⅝-in. to ½-in. choke. Then it flowed 30 bbl. per hour through ¼-in. choke. Gas volume ranged from 650 to 2,800 M.c.f.d. This well is ¼ mile southeast of the 1 Lusk discovery. That well was completed recently in Bone Spring and Strawn. It also lies ¾ mile southeast of the 2 Lusk, a Morrow Pennsylvanian and Strawn

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producer. Morrow produces gas at this 2 Lusk discovery, and oil from the Strawn.

Geologists slate New Mexico meeting

THE New Mexico Geological Society will hold its twelfth annual field conference in the country around Albuquerque.

The conference will deal with the general geology, stratigraphy, structure, and economic geology of an area that includes segments of the Rocky Mountains, the basin and range province and the Colorado Plateau. The trip originates in Albuquerque and the caravan will return to the city after each day's excursion. Registration will take place at the New Mexico Union Building on the campus of the University of New Mexico from 5 to 10 p.m., Thursday, October 5. The registration desk will also be open at 7 a.m. on October 6. In addition registration can be accomplished enroute during the first day of the conference.

The route of the caravan on the first day of the conference, October 6, will be through the structurally and stratigraphically complex Sandia Mountains and the adjacent Hagan or Una del Gato basin. A sequence of rocks ranging from Precambrian to late Cenozoic will be reviewed and a number of complex geologic structures will be discussed. On the evening of the first day a banquet will be held in Albuquerque.

On the second day, October 7, the caravan will travel west from Albuquerque to the broad and picturesque valley of Rio Colorado and then proceed southward to the structurally complex Lucero uplift. Time will be spent examining very controversial geologic structure which is believed by some to be the result of low-angle thrusting and by others to be nothing more than large landslides.

On the third day, October 8, the route will take the caravan into the Sierra Nacimiento and through the immense Jemez caldera via San Ysidro Jemez Pueblo, and Jemez Springs and will descend into the valley of the Rio Grande by way of Los Alamos. The trip will end in the vicinity of Santa Fe.

Gas well may pay out in 2 weeks

California operator has big flow from offset to fault-block discovery. Gas brings 30 cents at wellhead.

A PAYOUT in 2 weeks.

This is the prospect for a gas well completed recently in Central California by McCulloch Oil Corp. The company is basing its optimistic payout time on the fact the new well is a stepout from a discovery well which paid for itself in less than 2 weeks.

The new completion, 2 Duarte, flowed at the rate of 9 M.M.c.f.d. through a ½-in. choke from four perforated intervals between 3,910-4,144 ft. The company feels the well is capable of making in excess of 30 M.M.c.f.d.

The 2 Duarte is ¼ mile southeast of the 1 Duarte, the fault-block discovery which had the quick payout. The discovery had 345 ft. of continuous pay, slightly better than the 204 ft. of pay in the No. 2. But McCulloch says the No. 2 "will approach" the No. 1's calculated open-flow potential of 170 M.M. c.f.d. (OGJ, Jan. 23, p. 146).

The two wells are located in 18-2n-1w in Contra Costa County about 30 miles northeast of San Francisco. And both are completed in the Domengine sand (Eocene).

McCulloch has stepped out ¼ mile east of the No. 2 with another Domengine test, the 2 Soite. Last week the well was drilling below 3,000 ft. toward a target depth of about 4,300 ft., which was total depth on the No. 2.

No. 1 figures. The fast payout on the 1 Duarte is due to two things: A high wellhead price and prolific production, particularly during a 30-day production test.

Gas from the discovery well is sold to Pacific Gas & Electric Co. at 30 cents per M.c.f. During a 30-day production test which ended August 12, the well produced a cumulative total of 1,278,706 M.c.f. of gas for a daily average of 38,311 M.c.f. The highest 1-day take was 40,261 M.c.f.

The gas during the 30-day test as a gross value of $383,000, easily paying the drilling and completion costs within 2 weeks.

PG&E is continuing to take gas from the well, but at lesser rates than the 30-day test average. The utility will start tests on the No. 2 within a few weeks and will move gas from this well on to the nearby markets in San Francisco.

The Duarte wells are two of four completions McCulloch has in Los Medanos field. The other two wells, however, are completed in a more shallow zone, the Nortonville.

The 2 Soite probably will be the final Domengine well drilled on the lease, but the company hopes to test prospective Cretaceous zones below the Domengine next year. McCulloch has drilled one dry hole in Los Medanos in the Domengine, the 1 Soite, which is ¼ mile north of the 2 Soite.

Significant well tested in Michigan

IN MICHIGAN an important extension or entirely new reef well is being tested by McClure, Hartman, and Mumble ½ mile northeast of the previously drilled Bell River-China pool, St. Clair County.

Their 1 Buckowski, NW NE SW 11-4n-16e, cored 295 ft. of reef, 2,230-2,525 ft., and gaged 2.480 M.c.f.d. on drill-stem run at 2,500-2,510 ft.

The 2,500-10 and later-run drill-stem at 2.510-25 ft. also showed oil. Bottom-hole pressure was checked at 1,120 psi. and flow pressure at 349 psi. Eight gas wells, each on 40-acre units, had been drilled previously in the pool.

The new development came as Michigan Consolidated Gas Co. confirmed reports that the utility has negotiated contracts for gas purchase with I. W. Hartman, McClure Oil Co., Sun Oil Co., and Humble Oil & Refining Co. Michigan Consolidated will build a 37-mile pipeline from the field to the east side of Detroit. The utility now markets gas in Detroit, supplied from out-of-state and local fields.

Bell River gas pool, only partly developed and defined in area, has

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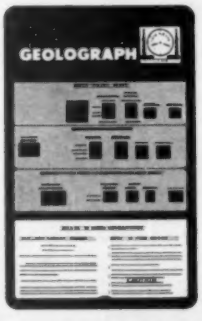

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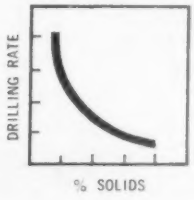
4 REASONS WHY MILK EMULSIONS DRILL FASTEST THROUGH HARD ROCK

Milk emulsions have cut time on the hole an average of 38%* on thousands of wells drilled in hard rock areas within the past five years. There are sound technical reasons —

1. No solids build-up — with milk emulsion fluids, low specific gravity solids drop out in the mud pits. Because the cuttings are oil plated they don't hydrate and disintegrate. They don't get pumped back into the well for further grinding with consequent mud weight build-up. Result — faster penetration.

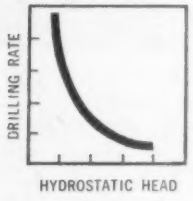


2. Low viscosity — because there is no solids build-up, you operate with low viscosity, low plastic viscosity and low yield point. Therefore, friction losses through the drill pipe and annular space are greatly reduced, and a higher percentage of the horsepower is available at the bit. Result — faster penetration.

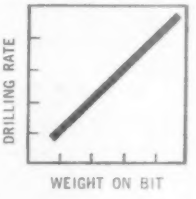
What are Milk Emulsions?

Milk emulsions are low-solids drilling fluids— water containing 5% oil and an emulsifier such as Trimulso, Drilling Milk or Atlosol.

3. Low hydrostatic head — low initial density, the absence of suspended low specific gravity solids and no solids build-up result in a lower hydrostatic head at the bottom of the hole. Result — faster penetration.



4. More weight on the bit — oil-wetting action of the emulsifier lubricates bearings and keeps the bit clean, extending bit life. More weight can be carried on the bit without increasing wear. Result — faster penetration.



In addition to faster penetration, other benefits of using emulsions made with Atlas emulsifier include better geological samples, better hole conditions and lower costs.

*Average of case histories cited in Aquaness Technical Manual on emulsion muds.

Atlas emulsifier is sold through distributors under the following tradenames . . . each is the product of Aquaness Department, Atlas Powder Company:

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• Worth Exploration Co. 1 Dubas, C SW SW 5-1n-5w, Lee Township wildcat, Allegan County, gaged 4,800 M.c.f.d. after acid and sand fracture at 1,645-52 ft. Section tested is in the lower Salina. Wildcat is located on a Humble farmout in the old East Pullman Traverse oil field.

Salt Creek township, Ohio, gets first gas production

In Ohio, the first producer in Salt Creek Township, Wayne County, was hit on a wildcat sunk by Ohio Fuel Gas Co. on 1 Henry Petersheim, Section 21.

This test found the Clinton sand at 3,796-3,829 ft. with a natural flow of 237 M.c.f.d. and a 90-hour rock measure of 1,210 psi. Gage after fracture was reported as 798 M.c.f.d.

• In southwestern Ohio, Morgan Petroleum Co. have blocked up about 10,000 acres and are ready to go on the first test of a six-well program. Location of the first test is on Fred Hannika in Ohio Township, Clermont County. A shallow well drilled near here in 1944 was reported to have had an open flow of 1 M.M.c.f.d.

Smackover production opened in Como field in East Texas area

Smackover production, indicated in previously reported drill-stem tests, has been opened in East Texas' Como field, in southern Hopkins County.

Como is one of the three additional East Texas areas in which the Jurassic formation has been found productive so far this year.

The Como discovery well, Delta Drilling Co.'s 5 W. H. Coker, flowed at the rate of 316 bbl .of 58.7°-gravity condensate with 2,226 M.c.f.d. of gas. Flow was through an adjustable choke with pressure of 2,226 psi.

The new Jurassic production at Como is a deeper-pay discovery. Previous production in the field, dating from September 1947, has been from the sub-Clarksville (Upper Cretaceous) sands at 4,000 ft.

Top of the Smackover section is 12,429 ft. Productive interval (perforated) is 12,730-12,830 ft. Total depth is 12,947 ft.

Como is 8 miles northeast of the rich gas-condensate West Yantis field, nearest other Smackover production, opened last year by Pan American Petroleum Corp. in northwestern Wood County.

East Texas Brooks dome lures more wildcatting

Another attempt is being made to tap the elusive but potential production of East Texas' Brooks salt dome in the southwestern corner of Smith County.

It is a 9,600-ft., possibly Glen Rose, test by John G. Voight, Tyler independent, on the southeastern flank of the dome. It is Voight's third test on the Roy Baker lease, and one of a a half dozen tests, all unsuccessful, started within the past year.

Location is 3 miles across the dome from a 14,000-ft. test Humble Oil & Refining Co. is drilling on the north flank. The latter, now below 12,300 ft., is Humble's third on its Wendlandt lease.

Dakota gas flows at Mesa County, Colorado, wildcat

Dakota Cretaceous gas production is reported at a wildcat discovery in Mesa County, western Colorado. The well is Amabassador Oil Corp. 1 Federal-Colorado-C in NE SW 35-9s-99w.

Flow was 4,500 M.c.f.d., natural, from perforations in the lower Dakota at 6,320-33 ft. Location is 11 miles southeast of Hunters Canyon field and 4 miles west of Corcoran gas production in 34-9s-98w.

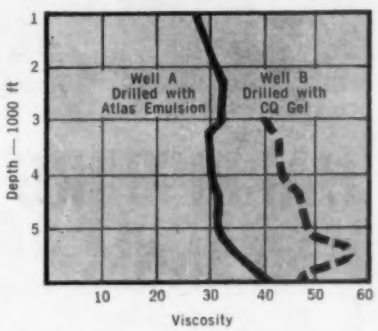
Special geology course offered at Texas A&M

The Department of Geology and Geophysics at Texas A&M, will offer a special course on "Fundamentals of Geology" for the petroleum industry from November 27 through December 21, 1961.

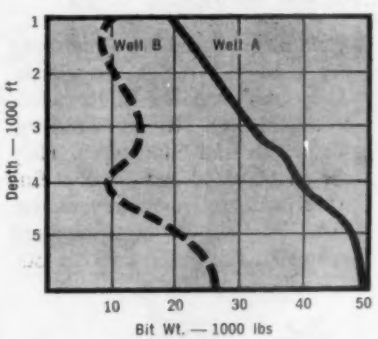
The course is designed for engineers, physicists, chemists, mathematicians, and lawyers as well as for supervisory personnel who have had no formal training in geology but need a basic understanding of

Atlas Emulsifier DOUBLES Penetration Rate On Wyoming Well

Faster drilling with an Atlas emulsion on a Big Horn Basin well in Big Horn County, Wyoming, cut rig time by 12½ days... penetration averaged 25.3 ft/hr compared with 12.8 ft/hr for an offset well. Typical of milk emulsion drilled wells, more weight was carried on the bit. Oil wetting provided better lubrication and extended bit life . . . 13 fewer bits were used. The Atlas emulsion used on Well A showed no solids build-up — viscosity remained virtually unchanged to TD. Acclaimed as the best-drilled well in the area to date, both contractor and operator attribute improved performance to the use of an Atlas milk emulsion. The



low-solids, low-viscosity, low water-loss emulsion maintained a trouble-free open hole and brought up clean cuttings that dropped out fast in the pits. Savings in rig time and bit costs for the 5400-foot comparison interval totaled $16,333.



Ask the Aquaness drilling specialist for complete information on all the benefits of Atlas milk emulsion drilling. His case histories show how Atlas milk emulsions have contributed to better wells, drilled faster with substantial savings in over-all costs.

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the geologic processes. The general plan and outline for the course have been patterned after a special course given for the past 5 years for the engineers of one major oil company.

The course will include a total of 58 hours of lecture and 75 hours of laboratory work during the 4-week period. In general, 3 hours each morning will be spent in lectures and 4 hours each afternoon in the laboratory. In addition, each student will be expected to complete rather extensive reading assignments. One field trip (Friday noon until Saturday night) will be given, with the students furnishing their own transportation or sharing expenses with other students having cars.

The registration fee is $250 and the course carries no college credit. Reservations should be made as soon as possible as the enrollment will be limited to approximately 25 men. Admission to the class will be based entirely upon the dates that applications are received.

Drillers tackle tough Canada well

IN ALBERTA, Texaco Canada and the drilling group for which it is operating bit into a real tough one when they topped the Banff section at their initial driller at Cutbank River, 45 miles south of the town of Grande Prairie and 230 miles west-northwest of Edmonton.

After opening up a very few feet of the zone, a blowout took place. The well was quickly brought under control at the surface but with tremendous pressure built up, it was feared that it might blow again. Rather than take a chance, the operator shut the well in and pumped cement down the drill pipe. This froze equipment in the hole. With all due precautions, the well, 7-33 Cutbank River, on LSD 7, 33-64-7w6, was prepared for production tests but the junk in the hole would not allow conclusive readings. After many days of unsuccessful testing it was decided to drill a new hole a short distance south of the first try.

The second Cutbank River test was started on LSD 3, 33-64-7w6 and with previous drilling records in hand, excellent time was being

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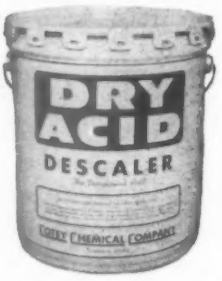

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made on drilling operations. That is, until the first of the freak explosions occurred. Drilling was carried out with air as the circulating agent by the Canamerican Drilling Corp., Ltd., Rig No. 3 below surface casing to a depth of 8,265 ft. After blowing up, the well commenced making considerable gas at surface despite the fact that no gas reservoir section had been drilled through. The well bore was loaded with drilling fluid to control the pressures and fishing commenced. To date, a fair amount of junk has been cleaned from the hole and fishing for some additional 3,250 ft. of drill pipe is being continued. The operator does not have much hope of recovering drill collars but would like to get as much material as possible from the current hole and thus recover as much usable hole as he can. When the fishing job is completed it is planned to whipstock past whatever junk was to be left in the hole and head on to the primary objective—that gas-bearing Banff sand. Depending on just how successful the fishing job is, it may have from 5,000 to 8,000 ft. of hole still to drill. It had washed down past the 5,000-ft. mark, and has to go to about 13,000 ft. to test the gas section indicated at the suspended No. 7-33 well. Projected depth has been set at 15,800 ft. for the hole, which will, it is hoped, test all zones to and including the D3 zone of Devonian.

Texaco Canada, through its affiliate, Regent Refining (Canada), Ltd., and the other partners in this project have a good spread of sites in the area, including drilling-reservation lands and leases selected from petroleum and natural-gas reservations. Major interest in the rights are held by Texaco, Bailey Selburn Oil & Gas, and French Petroleum Co., who hold 41.666%, 39.129% and 16.666% interests respectively, with small interests, about 1% total held by Camarillo Oils. Ltd., and Sarcee Petroleums, Ltd.

Gasser opens new field in Texas' Brooks County

Gas production has been found in a deep wildcat test drilled by Humble Oil & Refining Co. 1½ miles southwest of Pita field, in eastern Brooks County, South Texas.

Absolute open-flow potential is rated at 37 M.M.c.f.d. of gas. The well, 2 Robert J. Kleberg, Jr. (trustee), flowed 4,994 M.c.f.d. on a back-pressure test through an X-48 choke. Pressure was 2,415 ft.

Production is from Frio sand at 8,058-62 ft. (perforations). Hole was drilled to 10,000 ft. Flow is through 2⅞-in. casing, the first of two such strings to be run for a multiple tubingless completion.

The area is 9 miles northeast of Encino, and has been designated as West Pita field. Original Pita field, discovered in 1945, is productive of gas and oil from Frio sands from 7,100 to 8,200 ft.

New Wilcox field opens in Texas' Duval County

Wilcox sand has proved productive in a discovery 7 miles northeast of Freer, in Duval County, South Texas. It is a mile southeast of Northeast Loma Novia field, productive from the shallower Yequa horizon.

The new discovery well is Ramada & Associates' 1 Jane S. Mayer-State. It was drilled to 8,852 ft. and has Wilcox pay perforated at 8,754-69 ft. It is rated good for 3,100 M.c.f.d. of gas with a liquid recovery of 1 bbl. to 41 M.c.f. Gravity of the liquid is 59.5°. Shut-in pressure is 4,185 psi. Flowing pressure through 12/64-in. choke was 2,433 psi.

Prolific gasser extends Northeast Thompsonville

A southeast stepout well for the steadily expanding Northeast Thompsonville field in northwestern Jim Hogg County of South Texas has been completed with an open-flow potential of 50 M.M.c.f.d. of gas.

The well, George H. Coates' 5 Adolfo Trevino, is rated as one of the best wells so far completed in the area. Productive area now stretches nearly 6 miles from north to south with a width up to 2 miles.

Production of the well is from the field's 9,500-ft. "deep" Wilcox sand perforated at 9,804-12 ft. Total depth is 9.833 ft. with casing to 9,827 ft. Flowing pressure through 5/32-in. choke was 5,610 psi.

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August footage account in U. S.

	Field wells					Wildcats			
	Oil	Cond.	Gas	Dry	Service	Oil	Cond.	Gas	Dry
Alaska	32,915							14,832	16,080
Arizona				2,037		5,782			990
Arkansas	44,008		23,345	49,469				6,044	48,663
California	429,264		112,685	56,418	6,220			16,411	92,940
Colorado	35,107		51,867	49,267		9,493		5,170	94,738
Illinois	166,962		311	76,531	176,576	26,074			127,000
Indiana	57,747		250	70,054	2,720	5,732		2,059	19,743
Kansas	404,941		79,781	318,149	55,330	6,640		10,906	251,623
Kentucky	55,466		5,156	61,734	104,144	3,377			2,404
Louisiana	1,127,205	305,840	207,258	637,080		17,835		15,023	464,291
North	167,534	59,389	77,455	76,510		5,210			87,693
South	607,925	184,091	74,107	483,728		12,625		15,023	323,725
Offshore	351,746	62,360	55,696	76,842					52,873
Michigan	65,260		10,070	57,616	55,072	2,651		4,636	84,092
Mississippi	110,448	28,524		83,211		18,862			154,843
Missouri									5,538
Montana	129,270			8,676					72,857
Nebraska	90,324			96,571		26,323			215,605
Nevada									400
New Mexico	380,613		243,088	152,225		18,112			89,849
West	78,413		243,088	11,965		5,264			33,195
East	302,000			140,260		12,848			56,654
New York	17,550				13,500				
North Dakota	80,057			54,519		13,018			21,373
Ohio	124,308		47,186	47,544	14,814	3,184		3,829	8,387
Oklahoma	892,325	40,346	189,888	301,445	56,023	54,161		25,635	172,673
Pennsylvania	35,586		62,283	5,800	24,980			6,804	12,110
South Dakota									13,165
Tennessee								777	18,999
Texas	2,288,081	168,807	339,933	904,720	86,267	249,071	41,805	60,209	1,205,203
District 1	57,282		5,002	19,111		13,205	11,404	3,145	117,279
District 2	86,039	37,725	24,205	55,596		19,841	9,505	2,807	135,877
District 3	149,823	22,261	26,494	98,198	6,400	26,773	12,889	8,526	114,668
District 4	178,110	47,172	35,532	139,817		26,807	8,007	7,742	86,715
East (5 & 6)	231,852	10,510		64,892					196,048
District 7-B	107,994	7,790	29,979	75,436		21,663			122,811
West (7-C & 8)	952,288	12,379	112,435	274,993	45,385	88,771			262,886
District 9	351,063	30,970	4,757	143,386	32,762	21,124		3,038	114,627
District 10	173,630		101,529	33,291	1,720	30,887		34,951	54,292
Utah	25,953			14,675		6,118			25,195
West Virginia	29,779		186,338	32,424	4,420				10,805
Wyoming	88,198		22,533	30,464		7,370		2,844	106,808
Total August	6,711,369	543,517	1,581,972	3,110,629	600,066	473,803	41,805	175,179	3,336,374

. . . and in Canada

	Field wells				Wildcats		
	Oil	Gas	Dry	Service	Oil	Gas	Dry
Western Canada	738,512	197,557	103,788	32,382	60,969	32,862	142,292
Alberta	536,320	189,145	55,021	32,382	56,930	32,862	106,765
Saskatchewan	175,782	2,764	44,418		4,039		22,663
Manitoba			2,530				4,876
British Columbia	26,410	5,648	4,399				7,988

Drillers try to extend Texas' Smackover

AN ATTEMPT is being made to extend East Texas' prolific West Yantis Smackover production northeastward across the county line from northwestern Wood County into southern Hopkins County.

It follows a recent major extension the opposite direction, 3 miles southwestward into northeastern Rains County. Extension into Hopkins County will make this a three-county producing area.

The Hopkins County extension attempt is a 14,000-ft. Smackover test being started by Pan American Petroleum Corp. Location, on the company's Sartin lease in the Berry West Survey, is 4,300 ft. northeast of this company's nearest well, 1 M. S. Neindorff, on the Wood County side of the line.

The recent 3-mile extension into Rains County was made by Humble Oil & Refining Co. with a well (1 Louis Beall) good for 46,500 M.c.f.d. of wet gas from perforations at 12,588-12,618 ft.

In the meantime, Pan American has completed its fourth Smackover producer in the area. All are in Wood County, where its discovery well (1 McKee) was completed in July 1960. The fourth well, 1 Edson-Brown, is ¾ mile west of the discovery well. In early tests it flowed at the rate of 2,990 M.c.f. of wet gas daily through 14/64-in. choke. Its pay is perforated at 12,864-74 ft. Nearest producer is 3,000 ft. northeast.

New Smackover production for Hopkins County has been opened only recently in a deeper-pay discovery by Delta Drilling Co. in Como sub-Clarksville field, about 8 miles northeast of the West Yantis area. Delta's well is rated good for 4,800 M.c.f.d. of gas, open flow, with a condensate recovery of 316 bbl. per M.M.c.f. Pay interval is 12,730-12,830 ft.

Pennsylvania's Crawford County adds discoveries

DISCOVERY NEWS in northwestern Pennsylvania centers on a new oil discovery and a 9 M.M.c.f.d. gas discovery, both in Crawford County. The oil strike is Benedum Trees Co.'s well on the William Page farm, 2 miles east of Conneautville. The gas discovery is Flanigan Brothers Drilling Co.'s Spring Township, 2 miles west of Conneaut Valley High School, off Route 18.

The oil well was completed at 3,911 ft. Oil is from pay at 3,750 ft. The well made 15-20 bbl., the best oil find in this section for many years. It also makes 100 M.c.f.d.

The gas well made 9,184 M.c.f.d. Both wells are part of a spirited drilling campaign now under way in northwestern Pennsylvania—a play that began in northeastern Ohio's Conneaut area a couple of years ago.

DISCOVERIES

NEW MEXICO

Eddy County:

Gulf Oil Corp. 1 Hackberry Hills unit, 7 miles west of Carlsbad in 1-22s-25e. IPCAOF 6,800 M.c.f.d., Pennsylvanian 9,622-54 ft. IPF 101 BCPD. TD 11,536 ft. New gas-condensate discovery.

Rio Arriba County:

Foutz & Bursum 1 Bayless-Whigham, NE NE 27-28n-1w. IPP 70 BOPD, Sanastee discovery, new field. Open hole 5,168-5,264 ft. TD 5,264 ft.

NORTH DAKOTA

Billings County, Medora area:

Shell-NP 41X-5-1 Federal, NE NE 5-143n-101w. IPF 136 BOPD, trace water, 43.4°, GOR 1,230:1, 16/64-in. choke, TP 175 psi., Bakken-Three Forks discovery, 10,682-92 and 10,705-15 ft. TD 13,018 ft. New field.

OKLAHOMA

Garvin County:

Rockland Oil Co. 1 Seymour, 2 miles east of East Pauls Valley pool in SE SW NW 23-3n-2e. IPF 22 BOPD, ¾-in. choke, FTP 15, McKinney and Bruns commingled, 2,442-2,507 ft. TD 2,771 ft. PB 2,518 ft. New oil discovery.

Kingery Drilling Co. 1 Beddo, 2 miles southeast of East Pauls Valley pool in NW SE NW 27-3n 2e. IPF 84 BOPD, 16/64-in. choke, natural, 30°, second Bromide sand 2,532-33 ft. TD 3,196 ft. New oil discovery.

Noble County:

Toto Gas Co. 1 Ebersole, 2 miles north of Perry in 11-21n-1w, NW SE NW NW. IPF 250 M.c.f.d., ¾-in. casing choke, SITP 600 psi., upper Sams sand 1,548-54 ft. TD 1,626 ft. New gas discovery.

Okfuskee County:

Trend Petroleum Co. 1 Earl Walker, NW NW SE 6-13n-10e. 1½ miles north of Haydenville field. IPF 935 BO 17 hours, FTP 250 psi., ½-in. choke, FCP 1,000 psi., SITP 600, SICP 1,100 psi., 29°, Dutcher sand 2,813-78 ft. TD 3,610 ft. New oil discovery.

Texas County:

Ambassador Oil Corp. 1 Wiens, C SE NW 10-3n-18eCM. IPF 60 BO/5½ hours, 16/64-in. choke, FTP 65 psi., upper Morrow 6,342-46 ft. TD 6,900 ft. New oil discovery.

NORTH TEXAS

Jack County:

W. T. Waggoner Est. 1 J. Newton Huff, 9 miles east of Jacksboro in David K. Davis Sur., A-181. IPAOF 1,250 M.c.f.d., SITP 1,349 psi., GLR 178,200:1, 61.5°, Caddo 4,820-32 ft. TD 5,010 ft. New gas-condensate discovery.

Throckmorton County:

Currey Oil Co. 1 Atkinson, Section 1, TTRR Sur., A-881, 5 miles southeast of Throckmorton. IP 271 BOPD, 14/64-in., 41°, 320 psi., perf. 4,128-34 ft., upper Caddo lime; and 260 BOPD, 14/64-in., 40°, 270 psi., perf. 4,625-35 ft., Conglomerate. TD 4,659 ft. New-field discovery.

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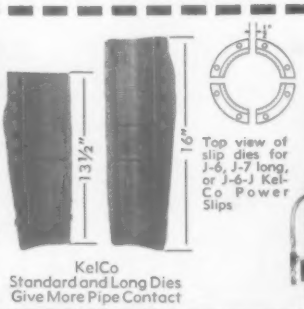

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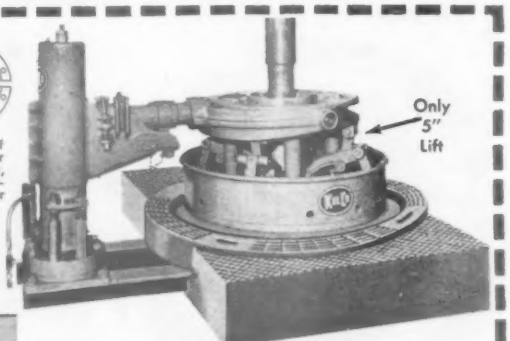

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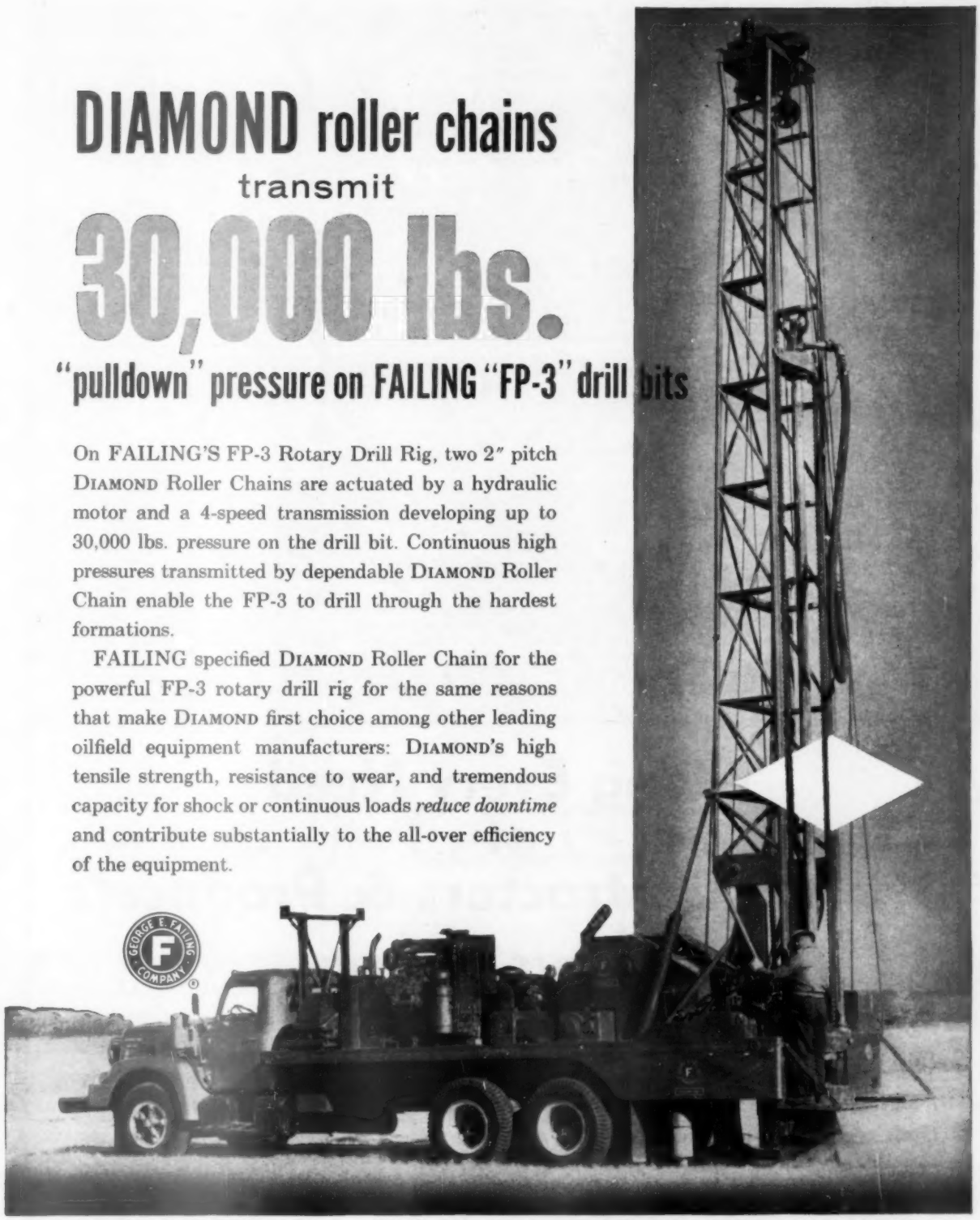

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Young County:

Texaco Inc. 1 F. V. Hinson, 5 miles northeast of Jean in Sec. 1,471, TE&L Sur. IPF 135 BOPD, 12/64-in. choke, TP 270 psi., 43.5°, GOR 613:1, Mississippian 4,972-5,010 ft. TD 5,400 ft. PB 5,136 ft. New oil discovery.

TEXAS PANHANDLE

Lipscomb County:

Pan American Petroleum Corp. 1 Adolph Redelsperger, 11 miles southwest of Follett in Sec. 892, Blk. 43, H&TC Sur. IPF 4,600 M.c.f.d., Cleveland 7,589-7,621 ft. TD 9,950 ft. New gas discovery.

Ochiltree County:

Shamrock Oil & Gas Co. 1 Helen D. Nabers "A," 20 miles southeast of Perryton in Sec 322, Blk. 43, H&TC Sur. IPF 519 BOPD, ½-in. choke, 41.5°, GOR 5,550:1, FTP 1,650 psi., upper Morrow 9,592-9,620 ft. TD 10,790 ft., PB 10,591 ft. New oil discovery.

Shamrock Oil & Gas Co. 1 Nelson W. Willard, Section 101, Block 13, T&NO Sur., 12 miles southwest of Perryton. IP 3,100 M.c.f.d., calculated open flow, shut-in TP 2,142 psi., perf. 9,395-9,402 ft., lower Morrow. TD 9,640 ft. Extension discovery in Buhler area, 2 miles southwest of gas production in East Farnsworth field.

Ellis Ranch area. Shamrock Oil Gas Co. 1-A Carl Mason, 12 miles southeast of Perryton in Sec. 935, Blk. 43, H&TC Sur. IPP 106 BOPD, 37.1°, GOR 246:1, Cleveland sand 7,085-7,159 ft. TD 9,515 ft. PB 7,383 ft. New oil discovery.

Roberts County:

D. E. Pinion 1 G. H. Mahler, 12 miles west of Canadian in Sec. 27, Blk. 44, E. E. Polly Sur. IPF 375 BOPD, 12/64-in. choke, 43°, Cherokee sand 9,602-14 ft. TD 12,032 ft. New oil discovery.

SOUTH TEXAS

Hidalgo County:

Shell Oil Co. 1 Luisa B. de Cavazos, Tract 7, Bazan Acres, Share 9-A, San Ramon Grant, A-62, 4 miles southeast of La Reforma. IP 27 BOPD, 35% water, ¼-in., 48.7°, TP 235 psi., GOR 8,735 cu. ft. per bbl., perf. 11,005-16 ft., Vicksburg. TD 11,800 ft. Deepersand discoverwy in San Ramon area.

Karnes County:

Standard Oil Co. of Texas 1 T. Labus, J. Curtis Sur., A-81. IP 245 BOPD, 15/64-in., 39.2°, TP 680 psil, GOR 2,630 cu. ft. per bbl., perf. 10,808-838 ft., Edwards. TD 11,100 ft. Discovery well of Labus field (north of Persons field).

Lavaca County:

Christie, Mitchell & Mitchell 1 Lewis Allen, B. Noble Sur., A-346, 5 miles north of Provident City. IP 143 BOPD, 8/64-in., 33.5°, TP 855 psi., GOR 330 cu. ft. per bbl., perf. 6,028½-33 ft., Yegua. TD 8,841 ft. Discovery well of Allen field.

Live Oak County:

Ford & Hamilton 2 Alma Bell, A. Parks Sur., A-322, 7 miles west of Lagarto. AOF 14 M.M.c.f.d., GLR 40 M.c.f. per bbl., 66.7°, shutin TP 1,973 psi., perf. 5,196-5,202 ft., Yegua. TD 5,513 ft. New pay discovery in Alma Bell field.

Nueces County:

Arnold O. Morgan and Southern Minerals Corp. 43-1 Chapman heirs, Section 43, Laureles Farm Tracts, 6 miles southeast of Petronilla. IP 170 BOPD, 9/64-in., 60.3°, TP 1,215 psi., GOR 1,675 cu. ft. per bbl., perf. 6,940-46 ft., Hight sand. TD 7,502 ft. New-field discovery north of Arnold-David field.

SOUTHWEST TEXAS

Edwards County:

Hank Avery 1 Wardlaw Brothers, Section 81, Block D, GC&SF Sur., 42 miles south of Sonora, IPP 5 BOPD (net), 10% water, 16.8°, open hole 284-320

(Continued on Page 269)

LEGAL

THE CENTRAL NEBRASKA Public Power and Irrigation District desires to receive bids on the sale of oil and gas leases on its properties in Western and Central Nebraska. The total area involved is approximately 54,000 acres. The area consists generally of: (1) a 40,000 acre tract used as the Lake McConaughy water storage reservoir on the North Platte River in west central Keith County, Nebraska, about nine miles north of Ogallala, Nebraska; (2) a 10,000 acre strip of land used as a power canal right of way extending along the south side of the Platte River Valley from North Platte, Nebraska, east to Lexington, Nebraska; and (3) 4,000 acres consisting of the right of way for main irrigation canals in the area between Elwood, Nebraska, and Hastings, Nebraska. Sealed bids are to be received at the office of the District on November 1, 1961. For further details, contact the Assistant Secretary of the District, Box 749, Hastings, Nebraska.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Indian Affairs, Uintah and Ouray Agency, Fort Duchesne, Utah. Sealed bids will be received until 2:00 P.M. Mountain Standard Time, November 1, 1961, and opened at that time in the office of the Superintendent, Uintah and Ouray Agency, Fort Duchesne, for the leasing of 1,298.54 acres of allotted Indian lands, in Townships 12 and 13 South, Ranges 19, 20 and 21 East, Salt Lake meridian, Uintah County, Utah, for oil and gas mining purposes. Details of the lease opening and how and where to file bids may be obtained by addressing an inquiry to the Superintendent, Uintah and Ouray Indian Agency, Fort Duchesne, Utah.

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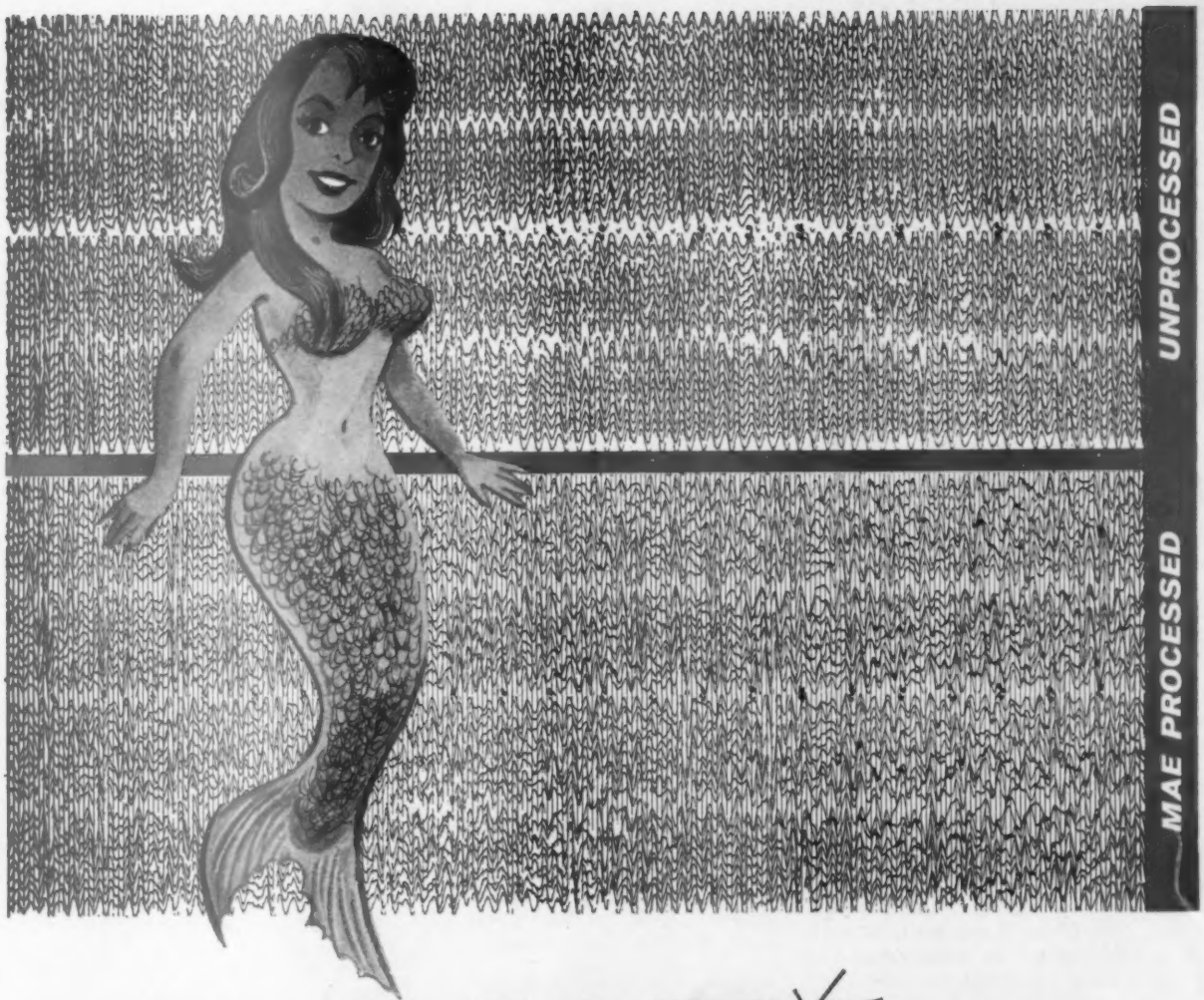

what can MAE* mean to you

Who said mermaids were mythical? MAE is a mermaid, but marine seismic explorationists know she's anything but a legend!

In areas where water reverberations mask reflections from depth, MAE (GSI's Multiple Analyzer Eliminator) is not only a fact, but a definite factor in providing workable seismic data. GSI . . . *and only GSI* offers the advantages of MAE, and MAE-processing can only be accomplished if the special recording techniques used on GSI vessels in both hemispheres are used in the original data gathering.

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A TEXAS INSTRUMENTS COMPANY

GARDNER-DENVER MAKES THE NEWS

Important changes are now in progress in the drilling industry. As holes have become deeper and costs per foot drilled have continued to rise, operators have become aware of the advantage in using equipment that has been engineered to work together as a balanced team for maximum speed and efficiency. It is only natural that the ultimate in operating economy and efficiency can be achieved when there is a single source for engineering, fabrication and service of this equipment.

Recognizing this need, Gardner-Denver, one of the largest manufacturers of mud pumps, air compressors and air drilling equipment, has now completed a full line of oil drilling equipment for every depth well from 4,000 to 30,000 feet.

Unique in the drilling equipment industry, Gardner-Denver equipment designs were not limited by existing equipment and tooling. Without fear of obsoleting existing stocks, Gardner-Denver engineers directed their efforts to producing the most advanced equipment that could be built . . . to developing new concepts of torque/speed combinations that would give more usable horsepower and lower maintenance costs.

Typical of these new Gardner-Denver drawworks designs is the Gardner-Denver 1100, a 1,100 horsepower drilling unit for depths to 15,000 feet. Similar in basic design to the larger Gardner-Denver 2100 and 1500 drawworks, the Gardner-Denver 1100 is built around a single package, side skidded drawworks. All controls, transmission, auxiliary brake and drawworks are mounted on the main skid. This integral arrangement offers many time saving advantages, including faster rig-up and moving, positive alignment of transmission and permanently mounted control panel.

Rugged Drawworks Construction

Heavy steel plate, doubled at bearing centers for extra rigidity, is used for the drawworks housing. A continuous ring of steel plate is welded around shaft openings to eliminate distortion of the side plates. This feature greatly increases bearing life. Engineering of sprockets, ratios and bearings has been unitized to produce a balanced torque/speed combination that lengthens chain and bearing life.

Short Shaft Transmission

Hi and lo main drum clutches give the driller a selection of eight hoisting speeds and a reverse. The transmission is ratioed in four speed increases. Equalization of the speed increases has produced a smooth progression over the entire range.

Short shafts and bearing centers are an outstanding point of the transmission design.

Tension Bar Equalized Brakes

Extra braking power through 330 degree wrap brakes make the Gardner-Denver 1100 an easy-to-handle rig that will stop the heaviest load with precision. A tension bar equalizes both brakes for a balanced pressure on the rims. A centralized lubrication panel supplies lubricant to all brake linkage.

The driller can control the water level within the hydromatic brake without leaving his station. An indicator gauge and control valve are mounted on the console.

Matching compounds for two and three engines in both stair-step and in-line arrangements are available for the Gardner-Denver 1100.

A brochure covering each drawworks and companion equipment is available on the full Gardner-Denver line. Stop in at your nearest supply store or write direct for your copy.

Gardner-Denver has great faith in the future of the petroleum industry and the men who have made it one of our nation's most important assets. This confidence is expressed by the recent expansion of its Petroleum Division to include the manufacture of a complete line of drilling equipment: drawworks, rotary tables, swivels and blocks. To assure you of the finest equipment, Gardner-Denver has invested in new tools, plants and obtained the services of the industry's outstanding engineers. All of us at Gardner-Denver are looking forward to serving you through our expanded Petroleum Equipment Division.

(Advertisement)

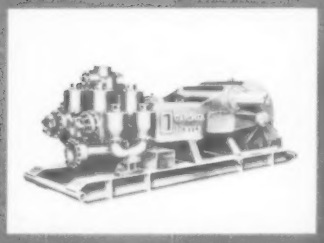
GARDNER-DENVER 1100 DRAWWORKS—A NEW CONCEPT IN DRILLING RIG DESIGN

Unique in the oil field equipment industry, Gardner-Denver was able to build the 1100 drawworks without fear of obsolescence for older designs in the field. From the ground up, the 1100 drawworks is a unitized design with each part and detail selected to give a balanced drilling rig that will operate with maximum efficiency under longest and hardest drilling service. ☐ One of a full line of Gardner-Denver drawworks for drilling from 4,000 to 30,000 feet, the 1100 fits programs in the 8,000 to 15,000 foot range. Representative of the entire line, the 1100 design features a new concept of torque/speed combinations that give more usable horsepower and lower maintenance costs. Its short shaft and large bearing arrangement extends service life of these vital components. All controls, transmission and auxiliary brake are integrally mounted on the main skid for faster rigging-up and moving. GARDNER-DENVER

See next page

©1961 Gardner-Denver Company, Quincy, Illinois

Balanced/Engineered Drilling Team



Gardner-Denver drilling equipment has been designed as a matched team for greatest drilling efficiency. In addition to the drawworks and compound there is a swivel, block, rotary table, mud pump and compressor to match every drilling program.

MUD PUMPS

Gardner-Denver mud pumps have earned one of the finest names in the drilling industry. Ruggedly built, they have double helical gears, counter balanced eccentrics and are fully pressure lubricated for long life of moving parts. Pumps are available in sizes to match the Gardner-Denver 1100 drawworks in rating and capacity.

22½ ROTARY TABLE

Only Gardner-Denver rotary tables have Turbo-lubrication to increase the life of working parts. Turbo-lubrication cools and lubricates every moving part with a fast-moving stream of oil. Picked up from the large reservoir by the pinion gear, oil is force-circulated by the ring gear — then centrifugal action speeds the oil flow and distributes it evenly over the gears and main bearing. This large volume of cool oil adds thousands of hours of maintenance-free service to Gardner-Denver rotary tables.

RIG-MATCHED EQUIPMENT
FROM CROWN BLOCKS TO PUMPS FOR THE

1100

GARDNER-DENVER DRAWWORKS

Write for the 1100 brochure today!

300-TON TRAVELING BLOCK

Fast, true fall characteristics have been engineered into the Gardner-Denver line of traveling blocks. Unhampered by old designs or tooling, a new ratio of weight to rated capacity has been achieved. For faster falling, up to 2,000 pounds of weight has been added over competitive designs without increasing outside dimensions. For smooth operation, fabricated sheaves with perfect balance . . . both dynamically and statically . . . are used. Matching crown blocks available.

300-TON SWIVEL

This new line of swivels is rated in "depth range" rather than in older terms of tonnage. This realistic concept is based upon actual field practice where depth, drilling load and speed are usually found consistent over a given drilling range.

Features: High pressure, easy change packing. Low center of gravity. High capacity bearings. Turbo-lubrication. Streamlined steel body for safety and strength.

Gardner-Denver equipment combines imaginative engineering and modern technology with a century of experience.

1 CENTURY

GARDNER-DENVER

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PROFILE

Texan mixes oil and politics

Tomlinson, new president of Texas Mid-Continent, is a dynamic spokesman for the oil industry.

IF ENERGY at the top means anything, the Texas Mid-Continent Oil and Gas Association may burst its organizational seams during the coming year.

Its new president fairly bristles with that commodity.

He is J. Clyde Tomlinson, amiable 57-year-old independent producer at Longview in East Texas.

It takes lots of energy, for instance, to move from a stenographic position to an executive position with a large company in 5 years.

Tomlinson did it—with Southern Crude Oil Purchasing Co. and Southern Pipe Line Co. (long since merged into what is now Pan American Petroleum Corp.)

Born in Louisiana, Tomlinson at 17 started a career which it appeared might put him anywhere but in oil. He studied business administration for 2 years at Commercial College in Tyler, Tex., then went to work in a lumber sales office in Hodge, La.

Two years later in 1925, he jumped at a chance to work for Southern Crude as secretary to the president. By 1931, when this firm and Southern Pipe Line were merged into Stanolind Oil & Gas Co., Tomlinson had moved up to assistant secretary and assistant treasurer of both companies.

With East Texas field expanding mightily, he promptly resigned, moved to Longview, and, with the late W. Ridley Wheeler, organized Producers Petroleum Corp. late in 1931 as a drilling and producing company.

Since Wheeler's death in 1959, Tomlinson has operated on his own, concentrating on production. Most of his producing holdings are in East Texas, with smaller interests in southern Arkansas, North Louisiana, and West Texas.

East Texas zooming. Recent heavy exploration in East Texas has borne out a long-term Tomlinson conviction that his home territory is a long way yet from dying out as an active oil and gas province.

J. Clyde Tomlinson
Longview mayor

"Good finds recently in the Smackover and James lime show we still have a tremendous potential for developing major new fields—especially in the deep beds.

"It's pretty expensive stuff for an independent—Smackover tests probably average around $300,000 apiece—but joint ventures offer possibilities."

Civic leader, too. If this sounds a little like chamber of commerce talk, it may not be entirely by accident.

Tomlinson is noted perhaps even more for his civic leadership in East Texas than for his oil activity.

He is, as a matter of fact, now serving as chairman of the Oil and Gas Committee of the dynamic East Texas Chamber of Commerce. And he was honored as recently as last August as the chamber's "Man of the Month."

Working with the chamber, he is credited with having done an amazing job of getting oil's story on depletion to the East Texas public.

His civic activity doesn't stop there. He is mayor of Longview—and has been for 10 years. He has served even longer (19 years) on the Longview City Commission.

Within the industry, Tomlinson now functions as a director of both the general Mid-Continent Oil and Gas Association and of the Independent Petroleum Association of America.

And he has been East Texas district vice president for the Texas Mid-Continent since 1956.

John G. McLean, New York, financial vice president of Continental Oil Co., has been elected a director of the company. He also has become vice president for international and financial activities.

Donald L. Klass has been named a division director at Pure Oil Co.'s Crystal Lake, Ill., research center. Klass has been with Pure since 1959.

G. R. Preston has been elected a vice president of Cities Service Petroleum Co. He will continue as treasurer and a director.

Jack A. Prather, assistant Rocky Mountain production division operating superintendent for Sun Oil Co., has been promoted to division superintendent, operating department. He succeeds the late J. B. Hamilton. Prather has been with Sun since 1946.

Jacobs Constructors, Inc., is new subsidiary set up by Jacobs Engineering Co., Pasadena, Calif., to handle construction and contract maintenance of process plants. **Dr. Joseph J. Jacobs** is president of the new firm. Vice presidents are **Stanley L. Krugman** and **John J. Harrington. Robert M. Barton** is secretary and **Karl E. Barth** is assistant secretary.

W. S. Sargent, crude oil purchase and sales representative in Ohio Oil Co.'s Tulsa production division, has been named assistant manager of the crude-oil purchase and sales division in Findlay, Ohio. He succeeds **L. T. Weger,** recently named manager of commercial and special-products sales. **A. A. Rosen,** Bridgeport, Ill., crude-oil purchase and sales representative, will succeed Sargent in Tulsa.

PERSONALS

Christopher S. Frings has joined Shell Chemical Corp.'s Norco, La., plant as chemist.

John T. Isberg, vice president of Superior Oil Co., has been transferred to Denver from Los Angeles.

William Reinhart has joined the research department of Standard Oil Co. (Ohio), in Cleveland as junior chemist in the petroleum-products section.

Robert W. Esser, production geologist for Mobil Oil Co. in Hobbs, N. M., has been transferred to Midland, Tex., as exploration geologist.

Stephen W. Schneider, geologist with Bamoil, Inc., in Dallas, has opened offices as geological consultant in Dallas. He will specialize in East Texas and South Texas exploration. Schneider was with Research, Inc., and Geophysical Service before joining Bamoil.

S. E. Buckley, who retired last month as manager of planning for Humble, has opened offices as petroleum consultant in Houston. Buckley had been with Humble 28 years. He served the company as manager of production research, assistant chief geologist, and assistant manager of exploration before becoming manager of planning. Buckley was active in industry associations and was a past chairman of AIME's Gulf Coast section. In 1956 he was named winner of AIME's Anthony F. Lucas Gold Medal. This year he was honored by the University of Texas as a distinguished engineering alumnus.

Richard R. Gray, northern and central district production engineer for Ohio Fuel Gas Co. in Wooster, Ohio, has been appointed general engineer in the production department. He will headquarter in Ohio Fuel's general offices, Columbus, Ohio.

Daring rescue wins Carnegie Award

WILLIAMS

A Carnegie Hero bronze medal and $750 award have been received by Leon A. Williams, captain of a Halliburton Co. oil-well service boat operating off the Louisiana coast. The recognition was given Williams for his daring role in helping rescue J. E. Darby, a California Co. engineer, from a capsized vessel in the Gulf of Mexico, on August 14, 1960.

Williams sighted two men standing on the bottom of the inverted vessel, rescued them, and then discovered that Darby was trapped inside in a passageway. When a professional diver said he was too unfamiliar with the ship to attempt a rescue, Williams offered to lead the way. Williams led the diver to the trapped Darby, who was provided with a diving mask and swam out.

John Grosso, petroleum engineer with Sinclair Oil & Gas Co. in Tulsa, has been assigned to Sinclair Somal Corp., an affiliate. He will headquarter in Mogadiscio, Somalia, East Africa.

George S. Eccles, president of First Security Co. and First Security Investment Co., Salt Lake City, has been named a director of Canadian Husky Oil, Ltd., and its subsidiary, Husky Oil Co. of Cody, Wyo.

O. J. Vincent has been elected president of La Fonte Oil Co., Kemmerer, Wyo. Other officers are **William O. King** and **James S. Baker,** vice presidents; **Paul J. Wataha,** secretary-treasurer; **John T. Hancock,** manager and a director; and **David J. Griffin,** geologist and manager of exploration.

Harold F. Winham, division manager for Shell Oil Co. in New Orleans, will receive a certificate of service from AIME's Society of Petroleum Engineers during the group's fall meeting in Dallas next week. The certificate recognizes exceptional services by members of the society.

Clayton B. Sears, assistant manager in charge of retail sales in the Cincinnati sales division of Standard Oil Co. (Ohio), has been promoted to manager of the division. He succeeds **John J. (Jim) Oram,** who has moved to the Cleveland home office marketing department staff. **Arvin C. Teschner,** manager of consumer sales in the Canton, Ohio, sales division, has moved to Cincinnati as retail sales manager.

M. L. Leierer, gas engineer for Superior Oil Co., has been transferred to Midland, Tex., from Chickasha, Okla.

G. W. Wilson has been promoted to process superintendent at Humble's Baytown, Tex., refinery. He will be responsible for operation of the butyl, butadiene, and solvents division.

John C. Duncan, district geologist for Freeport Oil Co. in New Orleans, has joined H. W. Bass & Sons, Inc., as district geologist in the company's new Louisiana Gulf Coast exploration office, New Orleans.

Dr. Ray J. Stanclift, Jr., senior research engineer with Jersey Production Research Co. in Tulsa, has been transferred to New York as sales engineer with Esso International.

J. E. Beavers, Bartlesville, Okla., has been named assistant superintendent of joint plants in Cities Service Petroleum Co.'s gasoline division. He succeeds **W. H. Heyland,** who has been transferred to Cities Service Gas Co. **Guy W. Duren** will succeed Beavers as superintendent of Area 3, which includes plants in Louisiana, East and South Texas. **Frank M. Allen,** superintendent of the Ambrose gasoline plant in Blackwell, Okla., has been named superintendent of Area 2, which includes West Texas plants. Allen will be succeeded by **Ed Lord,** superintendent of the Roberts Ranch plant near Odessa, Tex. **W. J. Templeton,** production engineer in Bartlesville, will succeed Lord.

Max A. Bolick, Cities Service Petroleum Co.'s Pampa, Tex., district superintendent, has been promoted to assistant division superintendent in Great Bend, Kans.

Dr. G. K. Guennel has been named supervisor of the new paleontology section, analytical department, at Ohio Oil Co.'s Littleton, Colo., research center.

Dale Caddy, superintendent in Pauls Valley, Okla., for Ohio Oil Co., has been named assistant Chickasha, Okla., district superintendent.

G. A. (Jim) Howard has been named manager of eastern operations, a new post with Geophysical Service, Inc. **T. P. Ellsworth,** Gulf Coast operations manager, has been named head of the new domestic offshore section. Howard, who had been manager of GSI's Far East

HOWARD

ELLSWORTH

operations, will headquarter in Houston for the present. His new eastern operations post combines work formerly under Gulf Coast and southeastern operations. Working with Howard in eastern operations will be **Virgil Teufel** and **J. M. Proffitt** in Shreveport, La.; **T. A. Halbrook,** Tulsa; **John Utesch,** Jackson, Miss.; and **Clark Allen** in New Orleans. Headquarters for Ellsworth's offshore operations will be in Houston. Also assigned to this section are **Marvin Gontarek,** Gulf Coast area, and **E. A. Kiesler,** West Coast.

Vernon R. Dodd has been named production superintendent of Cities Service Petroleum Co.'s Guymon, Okla., gasoline plant. He succeeds **C. E. Means,** who has retired. **W. R. Martin,** production superintendent of the company's May gasoline plant near Riviera, Tex., will succeed Dodd as maintenance superintendent of the Roberts Ranch gasoline plant near Odessa, Tex.

Mike Mahood, Houston, has been named production engineer in Tenneco Oil Co.'s Durango, Colo., district.

Douglas E. Masten, exploration geologist for Mobil Oil Co. in Midland, Tex., has been transferred to New York as staff geologist.

Bill T. Womack, geologist with Clark Oil & Refining Corp. in Denver, has been transferred to Casper, Wyo., in the same capacity.

C. F. Haworth, district geologist with Superior Oil Co. in Wichita Falls, Tex., has been transferred to Tyler, Tex., in the same capacity.

A. T. Jacobson, manager of Amerada Petroleum Corp.'s foreign department, has been elected a vice president. Jacobson joined Amerada in 1946. He was manager of Canadian operations before moving to Tulsa in 1956 as assistant manager of the foreign department. He became manager of the department last year.

Charles J. Cuppett, Jr., Chicago, has been appointed district manager in Houston for American Oil Co. He will supervise marketing operations in the Houston, Galveston, and Texas City area.

Hunter Eakle, Eakle & Holder, Evansville, Ind., has been elected chairman of the Tri-State chapter of American Association of Oilwell Drilling Contractors. Other chapter officers are **C. E. (Corky) Winn,** C. R. Winn Drilling Co., Salem, Ill., vice chairman; **Elmer Hoehn,** Evansville, secretary-treasurer; and **Don Gordon,** General Oil Field Supply Co., Olney, Ill., assistant secretary-treasurer.

Chet Guthrie has been named assistant vice president in charge of sales and general manager of wholesale sales for Frontier Refining Co., Denver. **James Parrish,** central division manager, has been promoted to assistant general sales manager. **Lohren Thompson,** western division manager, will succeed Parrish. **Jack Hull,** assistant central division manager, has been appointed assistant manager of wholesale sales. **Rick Robineau** has been named special sales representative in the Denver office.

Matthew V. Carson, Jr., has been elected a vice president of Sinclair Refining Co. and will succeed **Orville D. Judd** as Washington representative for the company. Judd, a vice president of Sinclair, will remain in Washington on special assignment. Carson, former director of the Office of Oil and Gas and first administrator of the mandatory oil import program, joined Sinclair in May 1961.

CARSON

Richard E. Pierson, senior research engineer at Amoco Chemicals Corp.'s Whiting, Ind., laboratory, has been promoted to chief process engineer at the Joliet, Ill., plant.

James B. Sheehan, geologist with Arabian American Oil Co. in Dhahran, Saudi Arabia, has returned to the United States and joined U. S. Geological Survey as geologist in Lincoln, Neb.

Hayward H. Hill, senior valuation engineer in Sinclair Oil & Gas Co.'s economics department, Tulsa, has been promoted to staff valuation engineer. In other economics department promotions, **Jerry B. Holder,** intermediate valuation engineer, has been named senior valuation engineer, and **Van H. Bland,** junior valuation engineer, has been named intermediate valuation engineer.

J. H. Pittinger has been named division production manager for Shell Oil Co.'s Houston production division. He succeeds **H. K. McKinnon,** who has been assigned to the area production department. Pittinger has been with Shell since 1949. In January of this year he was given a temporary overseas assignment for the company. He returned in June to a special assignment in the Houston area exploration department.

PITTINGER

C. C. Ingram, vice president of Oklahoma Natural Gas Co.'s land and geological department, has been promoted to executive vice president of the company. This post has been vacant since **H. A. Eddins** became president of Oklahoma Natural in 1955. **Jack B. Eley,** superintendent of the company's land and geological department, will succeed Ingram as vice president, land and geological. Ingram and Eley have both been with Oklahoma Natural since 1940.

INGRAM

Allen Dennis has been promoted to North Stoy, Ill., area foreman in Marathon Pipe Line Co.'s Tri-State region.

James B. Henderson, vice president and general counsel of Transcontinental Gas Pipe Line Corp., has been elected executive vice president of the company. He has been a director of Transco since March and will continue in this post.

Robert O. Koch, home office counsel for Tidewater Oil Co. in Los Angeles, will join Texas Gas Transmission Corp. November 1 as vice president and general counsel. Koch is a former Texas assistant attorney general.

Paul B. Ridlon, district superintendent in Wilson, Okla., for Cities Service Pipe Line Co., has been promoted to division superintendent for Kansas, Texas, and southern Louisiana. He will headquarter in Bartlesville, Okla. **Dean F. Smalley,** Bartlesville, will continue as division superintendent in Oklahoma, and **Harry O. McLeod,** Shreveport, La., will continue as superintendent of the Arkansas Pipe Line system.

H. Wayne Hill, Jr., formerly with Du Pont Co., has joined Phillips Petroleum Co. as section manager in exploratory plastics, Bartlesville, Okla.

L. T. White, manager of business research and education for Cities Service Co., and vice president of Cities Service Oil Co., has retired after 47 years with the Cities Service companies.

Robert W. Rettger has joined Transcontinent Oil Co. in Denver as petroleum geologist. Rettger had been with Sun Oil Co.'s Denver district.

Dr. Donald R. Diggs, head of the combustion division at Du Pont Co.'s petroleum laboratory in Deepwater Point, N. J., has been named assistant to the technical manager of Du Pont's petroleum chemicals division.

European headquarters have been set up in Geneva, Switzerland, by Monsanto Overseas S.A. (MOSA), subsidiary of Monsanto Chemical Co. **William M. Russell,** MOSA president, will be in charge of Geneva operations. **William R. Haas,** regional director of sales in Paris will move to Geneva with responsibility for coordination of sales throughout Europe. Also located in Geneva will be **Dr. Charles H. Davenport,** European technical representative, and **Donald B. Hirsch,** manager of economic planning for Europe.

Arnold Stebinger, regional vice president, Far East, for Mobil International Oil Co., has been appointed international government relations adviser in Socony Mobil Oil Co.'s new government-relations department.

Z. D. Bonner, formerly Far East manager for Gulf Oil Corp., has been named manager of the crude-oil department of Gulf Eastern Co. in London. He succeeds **F. R. Drury,** who has been transferred to the Pittsburgh general office to handle general staff duties in the crude-oil department. Bonner joined Gulf in 1941 at the Port Arthur, Tex., refinery. He moved to the Pittsburgh coordination department in 1954 and became Far East manager in Tokyo in 1958. Last year he returned to Pittsburgh.

BONNER

Joe Beard, North Texas district manager for Trice Production Co. in Wichita Falls, Tex., has been named manager of the new South Texas district with headquarters in Corpus Christi, Tex. **Joe Spaeth** will be district engineer in Corpus Christi and **Bill Ayres** will be district land man. Trice's North Texas district operations will be handled by the Oklahoma district.

DEATHS

Rae Preece, 63, retired geologist with Hancock Oil Co., died September 10 in a Dallas hospital after a short illness. Preece was with Hancock 20 years in Midland, San Antonio, and Dallas before retiring in 1959.

William A. Frensley, 59, retired Tulsa independent producer, died September 22 in a Tulsa hospital.

Bradley F. Thompson, 59, Public Service Co. of Oklahoma industrial sales supervisor in Tulsa, died September 20 in Mobile, Ala., after suffering a heart attack. Thompson had gone to Mobile after attending a meeting of American Institute of Electrical Engineers' petroleum section in New Orleans. He was current president of Petroleum Electric Power Association and was also an officer of AIEE.

Albert L. Burwell, 76, industrial chemist with Oklahoma Geological Survey at the University of Oklahoma, died September 20 in Norman, Okla.

Ted Warkentin, 55, Lawton, Okla., businessman, died September 24 in an Oklahoma City hospital after suffering a cerebral hemorrhage. Among Warkentin's business interests were Decem Drilling Co., Big X Drilling Co., and Decem Petroleum Co. He served as vice president of the firms.

Louis Seaton Randolph, owner of Randolph Petroleum Co., Tulsa, died September 23 at his home in Tulsa. Randolph was with Pure Oil Co. before setting up his own company in the early 1920's.

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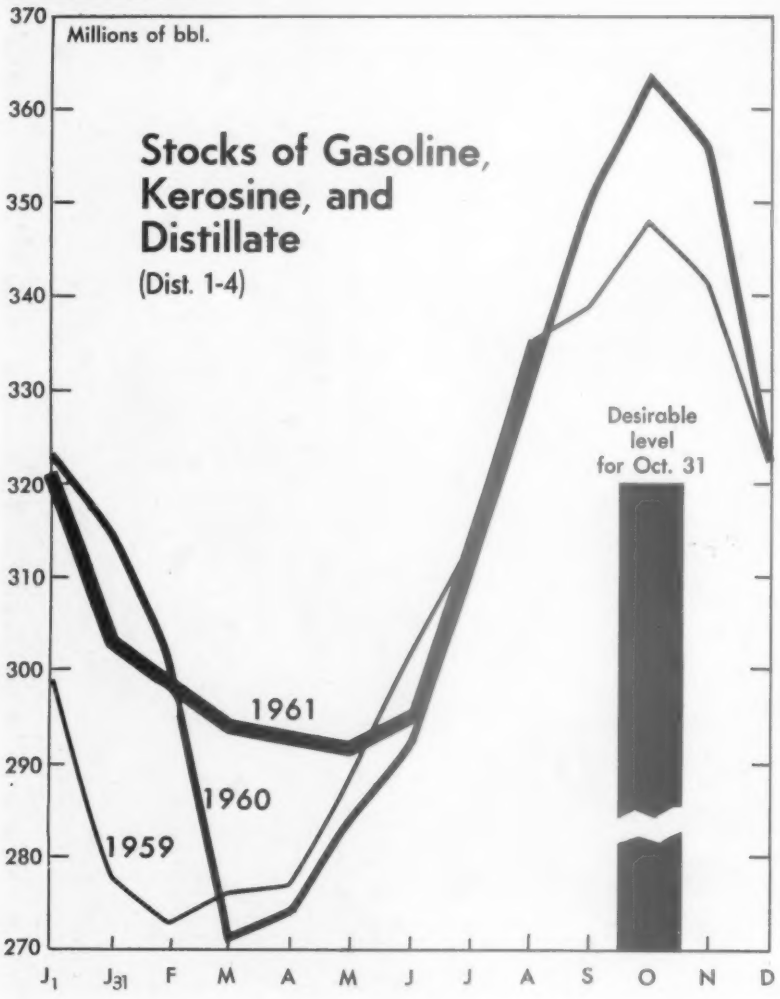


Carla cut runs; refiners may cut prices and profits

BY JOHN C. CASPER

HURRICANE CARLA caused a sharp drop in refinery runs on the Gulf Coast for week ended September 15. This reduction will tend to influence cargo prices for gasoline and distillate fuels, but the final effect will depend on refiners' reaction to the week's reduction in runs.

If refiners do not boost throughput to make up for the loss, distillate markets will tend to be firm and even gasoline may miss some of the end-of-season softness.

But, don't expect miracles from the big storm. Refinery runs for Districts 1-4 were off 1,240,000 bbl. daily for week ended September 15 or a total reduction of 8.7 million barrels for the 7-day period. Product stocks are more than that much above desirable levels in these same districts.

Even if refiners don't make up any down time, there will be plenty of clean products in storage to start the winter season. The big cut in runs did little more than halt the stock buildup for a week. The only important stock reduction was in gasoline, and there is no shortage of gasoline.

The big danger to markets will come if and when refiners on the Gulf Coast boost runs to make up for loss of output during the storm. Clean-product distribution is at the critical point of the marketing year.

Oil companies have reported estimates of desirable inventory levels for the end of October, and these estimates give us a base point for measuring surplus stocks. According to these reports, about 320 million barrels of gasoline, kerosine, and distillate fuel in Districts 1-4 will be enough to furnish a backlog against winter demand. Stocks already top this estimate by better than 20 million barrels.

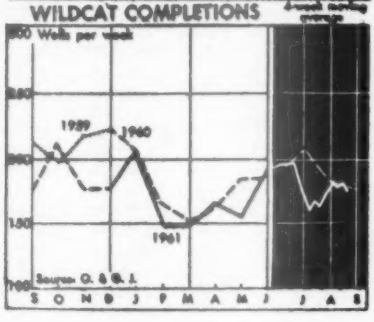
Lines on the chart show that these clean-product stocks continue to climb until about the end of October. The total already above desirable level for October 31. Each makeup barrel will add to the overage and to pressure on product prices.

For week ended September 22, refiners boosted runs to pick up a little more than half the reduction caused by the storm, and came within 72,000 bbl. daily of the total for same week last year.

A quick look at the highlights . . .

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	7,194,825	UP	41,335	UP	206,185
Crude stocks	248,070,000	UP	3,411,000	UP	17,708,000
Completions	798	DOWN	91	DOWN	144
Refinery runs	7,891,000	UP	650,000	DOWN	72,000
Gasoline stocks	187,599,000	UP	114,000	UP	693,000
Kerosine stocks	35,035,000	DOWN	265,000	UP	139,000
Distillate stocks	161,912,000	UP	1,057,000	DOWN	3,535,000
Residual stocks	49,722,000	UP	292,000	UP	1,378,000
Four-product stocks	434,268,000	UP	1,198,000	DOWN	1,325,000
Total imports	1,640,300	DOWN	53,100	UP	81,600

Active Rotary Rigs



	9-25-61	9-18-61	9-26-60
Alabama	3	5	3
Alaska	14	14	7
Arkansas	15	13	11
Arizona	1	1	1
California	94	90	87
Land	90	87	84
Offshore	4	3	3
Colorado	32	30	52
Florida	1	2	2
Land	0	0	1
Offshore	1	2	1
Georgia	0	0	1
Illinois	50	55	40
Indiana	15	13	8
Iowa	1	1	1
Kansas	96	95	122
Kentucky	5	4	4
Louisiana	284	269	289
North	35	38	37
S. Inland waters	105	96	117
S. Land	88	81	76
Offshore	56	54	59
Michigan	26	26	37
Mississippi	68	62	66
Missouri	2	1	1
Montana	19	23	25
Nebraska	21	26	23
Nevada	0	0	2
New Mexico	101	100	104
New York	2	1	2
North Carolina	1	1	0
North Dakota	14	14	16
Ohio	7	9	6
Oklahoma	207	216	155
Oregon	0	0	1
Pennsylvania	11	10	8
South Dakota	0	0	1
Tennessee	1	1	0
Texas	641	628	600
S. Inland waters	11	11	5
S. Land	173	174	156
Offshore	1	1	1
North	58	50	43
Panhandle	53	56	50
East	68	59	66
West Central	159	159	166
West	118	118	113
Utah	44	40	28
Washington	1	1	1
West Virginia	14	12	6
Wisconsin	1	1	0
Wyoming	62	64	72
Total U. S.	1,854	1,828	1,782
Cum. avg. to date	1,716	1,712	1,733
Western Canada	171	151	143
Eastern Canada	2	2	0
Grand total	2,027	1,981	1,925

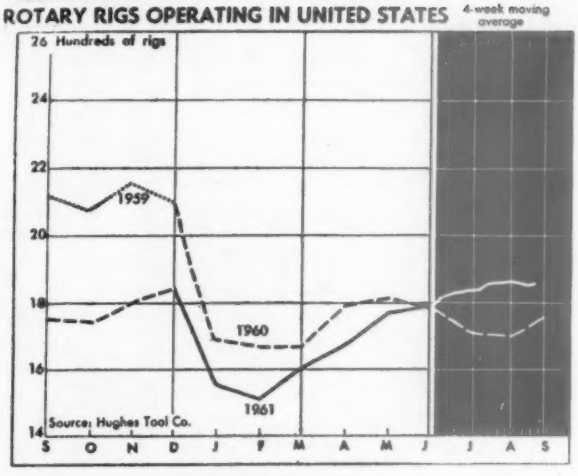
Hughes Tool Co. report.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED SEPTEMBER 23, 1961

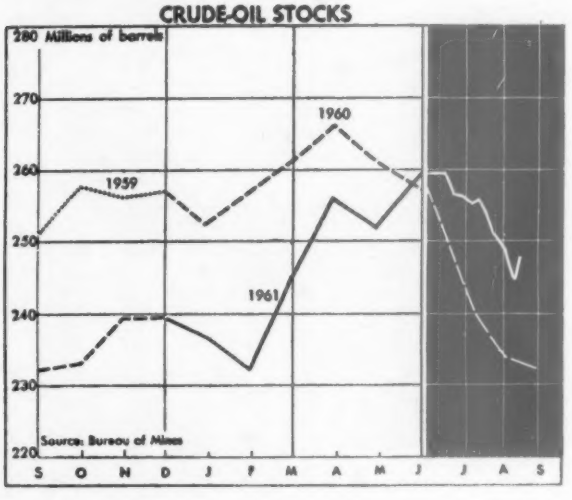
	Total wells							Cum.		Total wildcats					Cum.	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1961	1960	Total	Crude	Cond.	Gas	Dry	1961	1960
Alabama	0	0	0	0	0	0	0	31	33	0	0	0	0	0	7	2
Alaka	1	0	0	1	0	0	6,660	31	. .	0	0	0	0	0	6	. .
Appalachian	29	2	0	22	5	0	72,381	1,554	1,353	0	0	0	0	0	54	49
Arizona	0	0	0	0	0	0	0	18	28	0	0	0	0	0	10	18
Arkansas	9	4	0	2	3	0	32,057	371	436	1	0	0	0	1	81	116
California	54	42	0	3	9	0	233,598	1,259	1,184	6	0	0	0	6	194	224
Colorado	17	2	0	5	10	0	78,979	457	465	5	0	0	0	5	206	234
Illinois	34	16	0	0	17	1	76,261	1,464	1,646	13	3	0	0	10	331	343
Indiana	11	3	0	0	8	0	16,221	537	762	5	1	0	0	4	142	278
Kansas	59	34	0	3	22	0	199,229	3,631	2,712	9	1	0	0	8	668	760
Kentucky	30	4	0	8	18	0	52,627	1,401	1,531	2	1	0	0	1	96	127
Louisiana	56	15	1	1	39	0	355,425	2,771	2,592	16	0	0	0	16	444	397
North	33	9	1	0	23	0	118,058	1,110	973	9	0	0	0	9	195	191
South	20	4	0	1	15	0	206,505	1,254	1,253	7	0	0	0	7	209	181
Offshore	3	2	0	0	1	0	30,862	407	366	0	0	0	0	0	40	25
Michigan	21	2	0	2	7	10	49,026	568	672	4	0	0	0	4	202	175
Mississippi	13	2	0	0	11	0	115,590	394	504	8	0	0	0	8	140	194
Montana	8	3	0	0	5	0	55,098	286	233	4	0	0	0	4	134	109
Nebraska	12	3	0	0	9	0	62,212	724	637	8	0	0	0	8	363	260
New Mexico	32	16	0	9	7	0	213,493	1,302	1,351	3	0	0	0	3	215	203
West	12	2	0	9	1	0	65,885	570	460	1	0	0	0	1	68	54
East	20	14	0	0	6	0	147,608	732	891	2	0	0	0	2	147	149
North Dakota	4	2	0	0	2	0	24,685	188	219	0	0	0	0	0	49	59
Ohio	19	13	0	2	2	2	38,361	747	785	0	0	0	0	0	33	38
Oklahoma	75	43	0	12	15	5	337,066	4,143	3,410	2	0	0	1	1	413	549
Texas	272	147	9	15	93	8	1,202,212	10,548	11,457	50	7	0	2	41	2,223	2,348
Dist. 1	27	14	0	0	13	0	71,149	666	788	12	0	0	0	12	275	296
Dist. 2	13	7	3	0	3	0	96,200	567	569	2	1	0	0	1	156	142
Dist. 3	28	15	3	1	9	0	189,620	846	872	4	0	0	0	4	163	163
Dist. 4	14	8	0	3	3	0	82,817	870	790	5	1	0	2	2	210	222
East	14	8	1	0	5	0	68,714	868	933	3	0	0	0	3	228	188
Dist. 7-B	44	22	0	3	19	0	154,005	1,331	1,673	12	2	0	0	10	374	480
West	48	33	0	4	10	1	258,111	2,600	2,997	7	1	0	0	6	536	462
Dist. 9	68	32	2	0	27	7	206,242	1,940	2,083	4	1	0	0	3	201	351
Dist. 10	16	8	0	4	4	0	75,354	860	752	1	1	0	0	0	80	44
Utah	4	3	0	0	1	0	24,509	176	173	1	0	0	0	1	80	59
Wyoming	38	15	1	3	19	0	173,510	705	756	16	1	1	0	14	267	309
Miscellaneous	0	0	0	0	0	0	0	149	131	0	0	0	0	0	136	110
Total U. S.	798	371	11	88	302	26	3,419,200	33,455	33,070	153	14	1	3	135	6,494	6,961
Previous week	889	377	17	107	344	44	3,748,715	. . . .	. . . .	186	22	2	5	157	. . . .	. . . .
Cum. 1961	33,455	14,983	664	3,309	12,117	2,382	135,582,843	. . . .	. . . .	6,494	587	66	284	5,557	. . . .	. . . .
Cum. 1960	33,070	14,980	969	2,743	12,558	1,820	138,652,503	. . . .	. . . .	6,961	613	78	235	6,035	. . . .	. . . .
Western Canada	70	47	0	9	12	2	378,658	1,688	1,699	12	4	0	1	7	404	444

Production

ROTARY RIGS OPERATING IN UNITED STATES



CRUDE-OIL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

	9-16-61	9-9-61	9-17-60
Pennsylvania	2,366	2,411	2,327
Other Appalachian	1,477	1,597	1,569
Illinois, Indiana, Michigan	10,078	10,546	9,160
Nebraska and North Dakota	3,756	3,791	2,795
Kansas	8,803	9,033	8,518
Oklahoma	17,087	16,762	14,916
Arkansas	1,631	1,608	1,837
Louisiana	18,698	19,014	17,386
North	3,227	3,316	3,069
South	15,471	15,698	14,317
Mississippi, Alabama, Florida	3,590	3,476	1,659
New Mexico	8,920	8,691	8,337
Texas	105,306	102,061	96,604
East Texas	8,117	7,797	7,661
West Texas	47,946	45,385	47,169
Texas Gulf	18,114	18,409	16,305
Other Texas	31,129	30,470	25,469
Wyoming	16,506	16,353	15,120
Other Rocky Mountain	10,156	9,892	9,285
California	23,236	23,488	25,962
Foreign	†16,460	15,936	14,468
Total	**248,070**	244,659	229,943

*Bureau of Mines. †Includes 4,805,000 bbl. in California.

DAILY AVERAGE PRODUCTION FOR WEEK

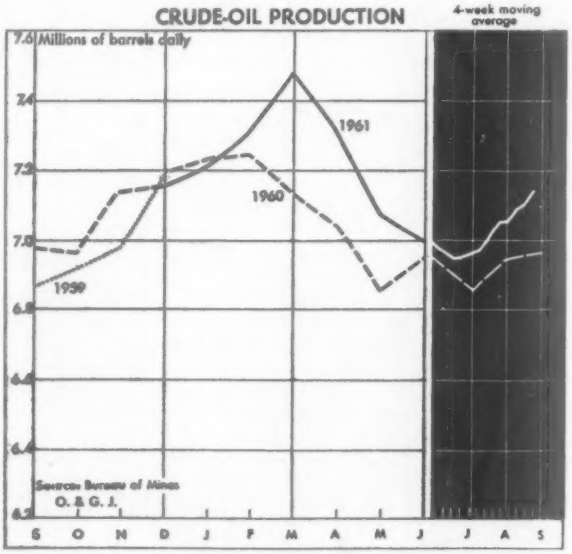
September 23, 1961

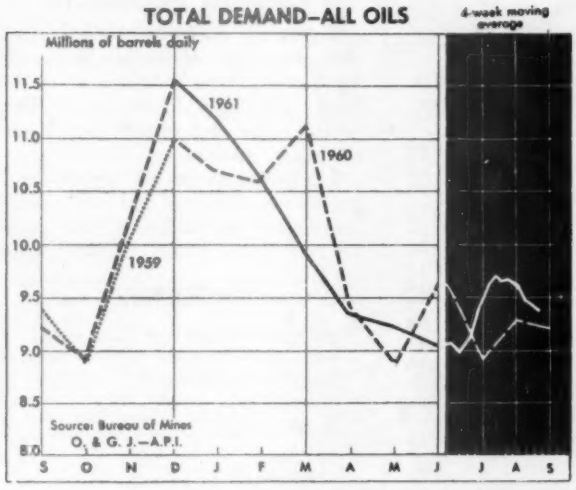
	Crude oil	Lease condensate	Total	Sept. 16 total
Alabama	17,000	.....	17,000	17,750
Alaska	21,500	.....	21,500	21,600
Arkansas	73,150	125	73,275	75,200
California	812,200	.....	812,200	812,550
Colorado	126,600	.....	126,600	127,300
Eastern	41,100	.....	41,100	40,000
Florida	1,000	.....	1,000	1,000
Illinois	210,000	.....	210,000	219,800
Indiana	30,500	.....	30,500	30,200
Kansas	†305,000	.....	†305,000	†298,940
Kentucky	51,400	.....	51,400	51,700
Louisiana	1,008,750	155,250	1,164,000	1,164,950
North	104,475	5,800	110,275	111,225
South	904,275	149,450	1,053,725	1,053,725
Michigan	53,000	.....	53,000	52,900
Mississippi	146,000	4,000	150,000	150,000
Montana	87,800	.....	87,800	88,900
Nebraska	68,700	.....	68,700	65,800
Nevada	400	.....	400	400
New Mexico	300,500	7,500	308,000	308,000
North Dakota	60,100	.....	60,100	58,600
Oklahoma	†534,600	.....	†534,600	†487,000
Texas	2,490,000	90,400	2,580,400	2,580,400
Dist. 1	43,000	2,700	45,700	45,700
Dist. 2	105,000	8,000	113,000	113,000
Dist. 3	327,000	38,000	365,000	365,000
Dist. 4	181,000	13,000	194,000	194,000
Dist. 5	27,000	650	27,650	27,650
Dist. 6	117,000	8,000	125,000	125,000
East Texas field	129,000	.....	129,000	129,000
Dist. 7-B	129,000	400	129,400	129,400
Dist. 7-C	109,000	3,450	112,450	112,450
Dist. 8	1,022,000	12,000	1,034,000	1,034,000
Dist. 9	194,000	2,500	196,500	196,500
Dist. 10	107,000	1,700	108,700	108,700
Utah	91,500	.....	91,500	93,200
Wyoming	406,000	.....	406,000	406,700
Others	‡750	.....	‡750	‡600
Total U. S.	6,937,550	257,275	**7,194,825**	7,153,490
Change from previous week, up			**41,335**	
Canada	†678,800	.....	†678,800	†668,200

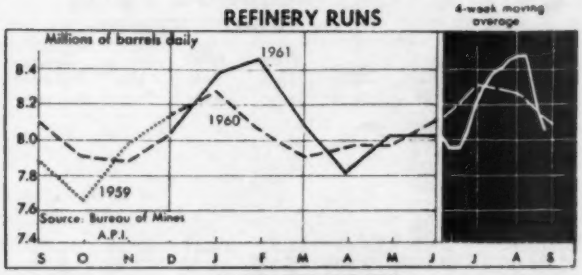
Total U. S. prod., January 1-September 23 .... 1,913,233,100 bbl.
Same period last year (crude plus cond.) ..... *1,874,885,100 bbl.

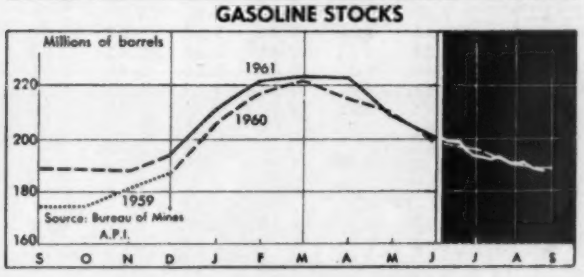
*Includes 60,333,200 bbl. condensate. †Week ended previous Monday. ‡South Dakota and Arizona.

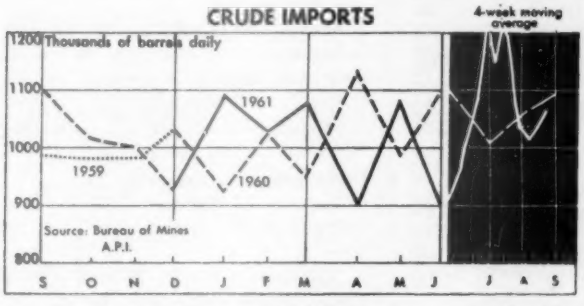
CRUDE-OIL PRODUCTION

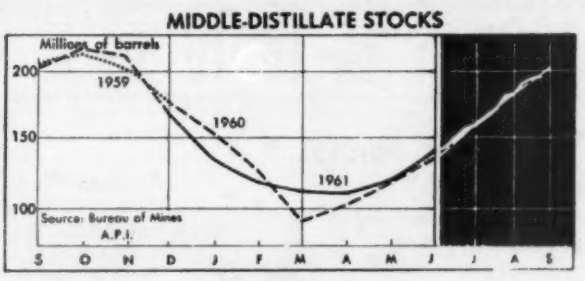


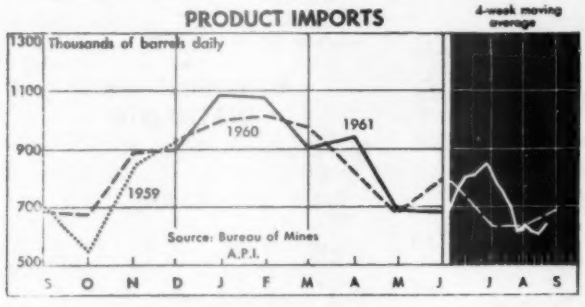


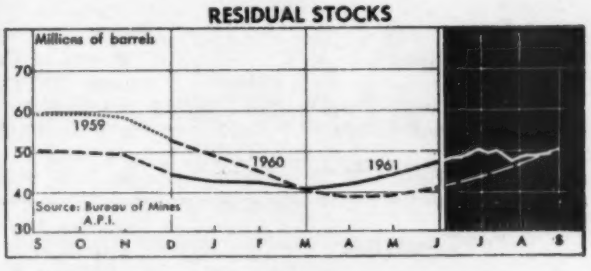












API REFINERY REPORT—SEPTEMBER 22, 1961

(Thousands of barrels)

District—	Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.	Stocks‡—Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, September 1960—Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.
East Coast	1,026	481.3	46.1	346.7	136.3	45,460	13,983	61,543	14,135	1,165	510.5	30.7	337.7	131.6
Appalachian:														
District 1	104	48.7	3.6	25.4	6.1	5,369	718	3,823	403	94	41.6	3.3	22.9	6.6
District 2	109	55.1	4.6	20.2	8.4	2,912	496	1,652	293	107	55.3	5.2	20.3	10.3
Ind., Ill., Ky.	1,537	815.0	76.1	331.0	139.0	31,846	7,334	30,422	5,729	1,473	787.3	68.4	318.5	130.9
Minn., Wis., Dak.	128	51.1	4.4	34.6	23.0	6,725	1,735	8,193	654	117	54.3	3.9	28.5	15.6
Okla., Kans., Mo.	771	410.9	10.9	193.0	19.3	17,933	1,904	12,804	1,089	738	415.5	7.9	190.1	19.0
Inland Texas	300	223.0	12.4	43.4	20.6	7,000	674	1,653	2,701	296	231.0	9.6	47.7	21.3
Texas Gulf Coast	1,560	166.2	107.7	382.0	113.1	22,493	3,358	15,012	4,751	1,850	977.9	125.0	453.7	138.5
La. Gulf Coast	689	363.2	75.9	142.0	42.3	10,602	1,563	5,901	1,015	646	363.8	63.5	147.1	40.1
N. La. and Ark.	117	66.4	3.3	34.2	5.7	6,197	872	2,287	194	108	63.7	7.3	19.5	7.6
Rocky Mountain:														
New Mexico	29	16.7	0.6	3.1	2.9	615	37	192	66	22	11.9	0.3	4.2	2.1
Other Rocky Mt.	296	141.7	4.3	62.4	33.3	5,423	676	2,939	1,180	294	142.5	2.9	63.5	29.7
West Coast	1,225	588.7	37.1	222.3	267.1	25,024	1,685	15,491	17,512	1,190	544.1	31.2	177.2	306.0
Sept. 22, 1961	7,891	4,028.0	387.0	1,840.3	817.1	187,599	35,035	161,912	49,722	8,100	4,199.4	359.2	1,830.9	859.3
Sept. 15, 1961	7,241	3,745.4	312.6	1,704.4	807.3§	187,485	35,300	160,855	49,430	.....	.....	.....	.....	.....
Sept. 23, 1960	7,963	4,082.1	312.7	1,803.4	912.6	186,906	34,896	165,447	48,344	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines. §Rev.

Prices

CRUDE-OIL PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.	Okla-homa	West Tex. (sour)	West Tex. (inter.)	No.* Texas	Texas Refugio Light	Bayou Sale (La.)	Denver Jules-burg	Wyo. (sour)
14-14.9	$1.86	.....	.....	.....	.....	.....	.....	.....	.....
15-15.9	1.93	.....	.....	.....	.....	.....	.....	.....	$1.81
16-16.9	2.00	.....	.....	.....	.....	.....	.....	.....	1.86
17-17.9	2.06	.....	.....	.....	.....	.....	.....	.....	1.91
18-18.9	2.13	.....	.....	.....	.....	.....	.....	.....	1.96
19-19.9	2.20	.....	.....	.....	.....	.....	.....	.....	2.01
20-20.9	2.27	$2.49	†$2.35	$2.61	$2.29	$2.95	$2.90	$2.58	2.06
21-21.9	2.33	2.52	2.38	2.63	2.33	2.97	2.92	2.60	2.11
22-22.9	2.40	2.55	2.41	2.65	2.37	2.99	2.94	2.62	2.16
23-23.9	2.46	2.58	2.44	2.67	2.41	3.01	2.96	2.64	2.21
24-24.9	2.53	2.61	2.47	2.69	2.45	3.03	2.98	2.66	2.26
25-25.9	2.60	2.64	2.50	2.71	2.49	3.05	3.00	2.68	2.31
26-26.9	2.67	2.67	2.53	2.73	2.53	3.07	3.02	2.70	2.36
27-27.9	2.74	2.70	2.56	2.75	2.57	3.09	3.04	2.72	2.49
28-28.9	2.81	2.73	2.59	2.77	2.61	3.11	3.06	2.74	2.54
29-29.9	2.87	2.76	2.62	2.79	2.65	3.13	3.08	2.76	2.59
30-30.9	2.93	2.79	2.65	2.81	2.69	3.15	3.10	2.78	2.63
31-31.9	3.00	2.82	2.68	2.83	2.73	3.17	3.12	2.80	2.67
32-32.9	3.06	2.85	2.71	2.85	2.77	3.19	3.14	2.82	2.71
33-33.9	3.12	2.88	2.74	2.87	2.81	3.21	3.16	2.84	2.75
34-34.9	3.17	2.91	2.77	2.89	2.85	3.23	3.18	2.86	2.79
35-35.9	3.22	2.94	2.80	2.91	2.89	3.25	3.20	2.88	2.83
36-36.9	3.27	2.97	2.83	2.93	2.93	3.27	3.22	2.90	2.87
37-37.9	3.31	2.99	2.86	2.95	2.95	3.29	3.24	2.92	2.89
38-38.9	.....	3.01	2.89	2.97	2.97	3.31	3.26	2.94	2.91
39-39.9	.....	3.03	2.92	2.99	2.99	3.33	3.28	2.96	2.93
40-44.9	.....	3.05	2.95	3.01	3.01	3.35	3.30	2.98	2.95

*Cooke, Grayson, Montague. †Other posting starts at $2.55.

FLAT PRICES

Louisiana:
- Sweet Lake $3.00

Texas:
- East Texas 3.05-3.25
- Conroe 3.23-3.53
- Van 3.08

Pennsylvania Grade:
- Bradford $4.80
- Middle District 4.52
- Southwest Pennsylvania 4.25
- West Virginia 4.17
- Buckeye Grade 4.08

Illinois Basin 3.00-3.05

FOREIGN

Middle East, Persian Gulf: (cargoes f.o.b. lifting port)
- Arabian, 34.0°-34.9°, Ras Tanura $1.80
- Iranian, 34.0°-34.9°, Bandar Mashur 1.78
- Iranian, 34.0°-34.9°, Abadan 1.73
- Iraq, 35.0°-35.9°, Fao
- Kuwait, 31.0°-31.9°, Mina-al-Ahmadi 1.59
- Qatar, 41°-41.9°, Umm said 1.95

Middle East, E. Mediterranean:
- Arabian, 34.0°-34.9°, Sidon $2.17
- Iraq, Mosul-Kirkuk, 35.0°-35.9°, Tripoli 2.19

Far East (cargoes, f.o.b. Lutong, Sarawak):
- Seria Light, 36° 2.42

Canada:
- Leduc-Woodbend $2.63
- Redwater (Alta.) 2.52
- Weyburn (light) 2.185
- ★ Midale C 1.89

Venezuela:
- Cumarebo, 47°-47.9°, Tucupido 3.34
- San Joaquin, 40°-40.9°, Puerto La Cruz 3.08
- Oficina, 35°-35.9°, Puerto La Cruz 2.80
- Tia Juana medium, 26°-26.9°, Amuay* 2.30
- Quiriquire, 16.0°-16.4°, Caripito 2.10
- Lagunillas heavy, flat, Las Piedras* 2.10
- Bachaquero, flat, 15°-16°, Las Piedras* 1.88

Price for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

TANKER RATES (Long ton)

(Latest reported spot fixtures)
- ★ Gulf-NY, clean (ATRS—10%) $2.57
- ★ Gulf-NY, dirty (ATRS—14%) 2.45
- ★ Carib.-NY, dirty (ATRS—67.5%) 0.89
- ★ PG-UK, dirty (Scale—65%) (21s. 10d.) 3.05
- ★ PG-Japan, dirty (USMC—75%) 2.55

★ Denotes change from previous week.

REFINED PRODUCTS

Following quotations are realistic spot prices for refined products moving interstate on Wednesday each week. They may differ from refiners' posted prices and should not be considered as postings.

Light-product prices are in cents per gallon. Residual and crude prices are dollars per barrel. Crude prices are at the well unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):
- Regular (91 octane) .. 10.00-10.50
- Premium (99 octane) 12.75-13.25
- Natural gasoline (26-70) 4.5
- Breckenridge 4.0

Gulf Coast (cargoes for coastwise or export movements):
- Regular (90 octane) .. 10.50-11.00
- Regular (92 octane) .. 10.75-11.25

California (rack) Los Angeles:
- Regular (90 octane) 11.60
- Premium (94 octane) 12.60
- Premium (100 octane) 14.10

Caribbean area (cargoes):
- Regular (87 octane) 9.00
- Premium (97 octane) 11.50

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):
- Kerosine 42-44 ..... 9.50-9.75
- Diesel oil (58 d.i. and above) 9.00-9.25
- Distillate No. 1 ..... 9.00-9.25
- Distillate No. 2 ..... 8.25-8.50

Gulf Coast (cargoes):
- Kerosine 41-43 ..... 9.50
- Distillate No. 2 ..... 8.50

New York Harbor (barges):
- Kerosine 42-43 ..... 11.20
- Distillate No. 2 ..... 10.20
- Diesel fuel, 48-52 d.i. 10.35

Caribbean area (cargoes):
- Distillate No. 2 ..... 8.10

RESIDUAL FUEL

Mid-Continent (Group 3):
- Residual fuel (max. 1% S) $1.65-1.75

Gulf Coast (cargoes):
- Bunker C fuel 2.20-2.30

New York Harbor (barges):
- Bunker C fuel 2.52

Caribbean (cargoes):
- Bunker C fuel 2.00

California (rack):
- Bunker C fuel, Los Angeles 2.25

ft., Paluxy. TD 320 ft. New-pay discovery in, and revives old Vinegarone field.

WEST CENTRAL TEXAS

Throckmorton County:

Currey Oil Co. 1 Atkinson, 5 miles southeast of Throckmorton in Sec. 1, TTRR Sur., A-881. IPF 271 BOPD, 14/64-in. choke, 41°, CP packer, TP 320 psi. upper Caddo lime 4,128-34 ft. TD 4,659 ft. New oil discovery.

WEST TEXAS

Andrews County:

Inez-Ellenburger and Fusselman field. Pan American Petroleum Corp. 193 Midland Farms "AK," 16 miles southwest of Andrews in Sec. 33, Blk. 41, T-2-N, G&MMB&A Sur. IPF 497 BOPD, 20/64-in. choke, 46.9°, GOR 900:1, TP 550 psi., CP packer, Fusselman 11,791-11,826 ft. IPF 588 BOPD, 12/64-in. choke, 59.7°, GOR 812:1, TP 1,475 psi., CP packer, Ellenburger 12,423-33 ft. TD 12,591 ft. New dual oil discovery.

Humble Oil & Refining Co. 295 J. S. Means, 7 miles north of Andrews in Sec. 22, Blk. A-35, PSL SUR. IPP 100 BOPD, plus 20% water, 37.8°, GOR 55:1, Devonian 12,001-9 ft. TD 14,155 ft. New oil discovery.

Borden County:

A. K. Guthrie 1 Fred Shafer, 6 miles southwest of Fluvanna in Sec. 424, Blk. 97, H&TC Sur. IPP 44 BOPD, plus 10% water, 23°, 5,713-33 ft. TD 8,420 ft. New discovery.

Crockett County:

Cities Service Oil Co. 1-B Bean, 16 miles southwest of Ozona in Sec. 34, Blk. M, James Mitchell Sur. IPF 11 BOPD, 20/64-in. choke, 35.4°, GOR 18,200:1, 6,440-6,670 ft. TD 10,402 ft. PB 6,792 ft. New oil discovery.

Menard County:

F. E. Shaheen Jr. 1-B Henrietta Harrison, 14 miles northwest of Menard in Sec. 12, Blk. 2, R. S. Winslow Sur. IPP 90 BOPD, 33°, GOR 400:1, Strawn 3,521-30 ft. TD 3,565 ft. New oil field.

I Sol Mayer, 5 miles northeast of McKavitt in Sec. 1,580, Lorenz Ziegler Sur. IPP 34 BOPD, 35°, no water, Strawn sand 3,843 ft. TD 4,315 ft. New oil discovery.

Pecos County:

Southern Minerals Corp. and General Crude Oil Co. 2-A Jasper CSL, 29 miles southeast of Pecos in Blk. 104, Jasper CSL Sur. 1, 1¼ miles northwest of Ellenburger gas production, 2¾ miles north of Clearfork and Canyon oil production. IPF 143 BOPD plus 26% water through ⅛-in. choke, 33.4°, GOR 4,935:1, TP 1,360 psi., CP packer, 6,840-50 ft. TD 11,269 ft. PB 7,208 ft. New oil discovery.

UTAH

San Juan County, Bluff Bench area:

Lion Oil Co. 1 Clark, NW NE 28-38s-22e. IPP 101 BOPD, cut 8% water, Ismay 5,906-28 ft. TD 6,118 ft. Ismay discovery, new field.

WYOMING

Campbell County:

W. C. Leone et al. 1 Halverson, C SE NW 9-49w-69w. IPP 200 BOPD, no water, 40.8°, Dakota 6,917 ft. TD 7,053 ft. Dakota discovery, new field.

Great Western Drilling Co. 1 Dead Horse, C SW SW 11-47n-75w. IPP 45 BOPD, plus 65-70% water, Parkman 7,257-71 ft., TD 7,370 ft. Parkman discovery, new field.

Crook County:

Davis Oil Co. 1 Federal-Schuricht, SW NE 11-52n-68w. IPP 377 BO in 16 hours, 22°, Minnelusa 6,782-6,804 ft. TD 6,909 ft. Minnelusa discovery, new field.

Park County, Silver Tip:

Texaco Inc. 55-33 unit, NW SE 33-58n-100w. IPP 130 BO, 98 BWPD, Madison 9,107-20 ft. TD 11,630 ft. Madison discovery, new pay.

Sublette County, Big Piney area:

Belco Petroleum Co. 1 Star Corral unit, NW NW 16-30n-113w. IPF 849 M.c.f.d., ⅜-in. choke, SICP 663 psi., Wasatch 1,627½-2,214 ft. TD 4,505 ft. Wasatch discovery, new field.

Sweetwater County, Patrick Draw field:

Texas National Petroleum Co. 1-8 Federal, C NE NW 8-19n-98w. IPF 8 M.M.c.f.d., 2-in. tubing, TP 200 psi., CP 800 psi., Fox Hills, 3,739-45 ft. TD 5,604 ft. Fox Hills discovery, new pay.

Sweetwater County:

Chandler & Simpson 1 Verbrugge-Government, C SE NE 2-18n-100w. IPF 1,500 M.c.f.d., 6 bbl. cond. per day, 24/64-in. choke, SIP 900 psi., Almond discovery, new field, Almond 2,361-71 ft. TD 2,844 ft.

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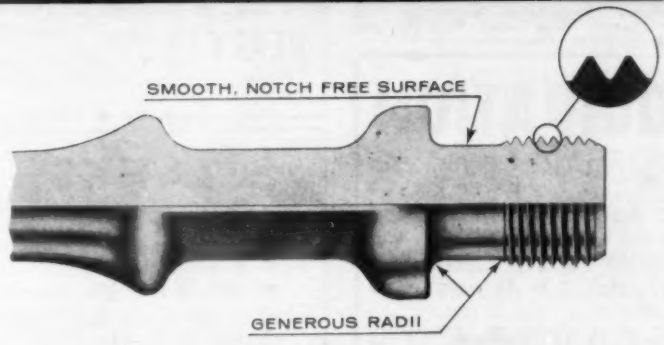

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Challenging opportunities for exceptional engineers with B.S. or Advanced degrees in Engineering having minimum of three years' experience in research or practical application of drilling practices, drilling mud, and completion operations to work in applied drilling research or in engineering innovation and field application. Assignments will involve analysis and development of improved drilling techniques. Considerable portion of work will be done in modern Research and Engineering Center in Tulsa; however, opportunities will be provided for both domestic and foreign travel in applying drilling and well completion technology to Standard Oil Company (New Jersey) affiliates world-wide.

Write in confidence to T. O. Allen, Manager of Drilling and Development Division, Jersey Production Research Company. 1133 North Lewis, Tulsa 10, Oklahoma.

HELP WANTED

PROCESS ENGINEER

Refinery Process Engineer with chemical engineering degree and minimum of 4 years experience for a modern refinery in Michigan. Furnish resume of education, experience, references and salary requirements to:

Box M-566, The Oil and Gas Journal
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MECHANICAL ENGINEER, age 33, over 14 years diversified experience in foreign and domestic petroleum refineries, last 4½ years in responsible management positions. Available now to relocate anywhere U. S. For complete resume write: 607 East Cherry St., Robinson, Illinois.

ENGINEER—Mechanical. 35. Twelve years refinery and chemical plant design, construction and operation, domestic and foreign. Interested in position with growth potential. Consideration will be given to all fields and locations. Box M-579, The Oil and Gas Journal, Tulsa, Oklahoma.

P.E. GRADUATE with diversified experience production, drilling, secondary recovery, evaluations, desires employment. Age 38. Free to travel. Write 821 N. Kingston, Tulsa, Oklahoma, or phone TE 5-2056.

PALEONTOLOGIST, 44 single, desires overseas position with oil company. 15 years experience with Tertiary and Cretaceous Foraminifera, and ammonites, in California, Colombia and Libya. Some field and wellsite work. Knows Spanish, learning Arabic. Box M-465, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST—Exploration thirteen years diversified experience Gulf Coast, Mississippi, Alabama, North Louisiana. Emphasis south Louisiana gulf coast. Will relocate. Complete resume on request. Box M-577, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM GEOLOGIST, Ph.D., 14 years experience USA and Venezuela. Exploration, basin evaluation, airphoto interpretations, reservoir studies, subsurface interpretations, mapping, reserves, drilling programs, reports. Desires position USA or foreign. Box M-576, The Oil and Gas Journal, Tulsa, Oklahoma.

NAVY CAPTAIN. 22 years experience marine aviation and sea duty interested in locating with Marine Department major oil company. Box M-587, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER desires position as production manager or chief engineer with aggressive independent operator specializing in secondary recovery operations. Ten years diversified experience in evaluation, development, operation of secondary recovery operations. Presently responsibly employed. Box M-588, The Oil and Gas Journal, Tulsa, Okla.

REGISTERED PETROLEUM Engineer, age 34, 7 years diversified experience with major and independent, completions, production, workovers, and economic evaluations, desires change. Resume upon request. Box M-591, The Oil and Gas Journal, Tulsa, Oklahoma.

APPALACHIAN BASIN—Geologist and Engineer, 36. Available January 1, 1962. Presently Division Exploration and Production Manager. Well known in basin. Current data on all geological, land, geophysical and drilling plays. Basic geologic research completed. Attractive proposition to an aggressive company desiring to enter basin, without large initial data gathering expense. Company should be willing to participate in drilling and land plays. Box M-592, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST: 34, 11 years varied on and offshore Gulf Coast Louisiana, Texas and Ark-La-Tex experience including sub-surface, seismic, stratigraphy, property evaluation and planning. 2038 Tolosa, Dallas, Texas.

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ONE THIRTY-SECOND (1/32) override for sale under one hundred thousand acres in Ohio and West Virginia. David Law, 716 Union Trust Building, Parkersburg, W. Va.

FINANCIAL—Investment Banking Houses and Underwriters reached. Confidential. You can send the details of your proposition direct or thru your attorney to Consultant 817—51st Street, Brooklyn, N. Y.

BUSINESS OPPORTUNITIES

WILL DRILL TEST well in southeastern Ohio with bottom hole money. Let me prove your acreage. I have thousands of acres in this vicinity. David Law, 716 Union Trust Building, Parkersburg, W. Va.

PRODUCER NEEDS associates to develop proven 160 acres. Bartlesville sand 750' deep, one well already drilled ready for completion Labette County, Kansas. For particulars write: Box M-547, The Oil and Gas Journal, Tulsa, Okla.

ST. LOUIS GROUP with substantial production interested in purchasing primary and secondary oil reserves in Illinois, Indiana, Kentucky or West Virginia. Can handle properties of any size. All replies confidential and all material forwarded will be returned. Box M-575, The Oil and Gas Journal, Tulsa, Oklahoma.

NEED PARTNER with tax dollars to drill wells in West Virginia and Ohio at actual cost. Wildcat and semi-proven acreage. David Law, 716 Union Trust Building, Parkersburg, W. Va.

OIL FIELD engine repair and supply business doing over $100,000 yearly in Kansas. A real buy. Box M-585, The Oil and Gas Journal, Tulsa, Oklahoma.

NEED partners to help drill Arbuckle test (under 2,000') on 480 acres in semi-proven area, Montgomery County, Kansas. Box M-586, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPLORATION PROSPECTS WANTED

Individual desires up to 25% interest in prospects being drilled before December 15th. Submit only ventures based on sound geology. Prefer extensive acreage and large potential per well. Deal and offeror must stand rigid inspection. Reply to:

EDMUND OIL & GAS
Attention G. R. Stocker, Geologist
P. O. Box 99, Barrington, New Jersey
Telephone: Area Code 609, Lincoln 7-3230

BUSINESS SERVICE

DELAWARE CORPORATION formed and serviced American Guaranty & Trust Company. P. O. Box 487, Wilmington, Delaware.

Attention—Majors—Independents—Brokers

If you need assistance in obtaining outstanding interests in oil and gas leases owned by individuals residing Southern California, we would like to offer our services.

THE PINKY TOMLIN COMPANY
Oil Properties
9889 Santa Monica Blvd., Beverly Hills, Calif, or,
Telephone CRestview 6-1424

REAL ESTATE

SMALL CHICKEN Ranch in Ozark Lake Country. For Sale at Bargain. Call or write E. A. Morse, Lincoln, Ark. Ph. TA 4-2531.

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offered for trade tax-free for producing royalty. Value $800,000, will trade with or without mortgage $275,000. Modern all respects, well rented, located Texas. Please submit information regarding royalty offered by absentee owner for trade.

Box M-534, The Oil and Gas Journal
Tulsa, Oklahoma

LEASE AND DRILLING BLOCKS

140 ACRE oil lease, Settle production, 12 Bbl. per day, for sale. Reason for selling bad health, and to dissolve partnership. For further information: Write Buel C. Wilson, Box 184, Scottsville, Kentucky.

SEVERAL LEASE BLOCKS, southeast Georgia, for sale, or drilling deals. Rotary drilling 4,000' slim hole, gas and oil seepages in area. T. R. Davis, P. O. Box 503, Phone 3639, Vidalia, Georgia.

OIL AND GAS leases in active area of Nebraska. Detailed information write: Box M-568, The Oil and Gas Journal, Tulsa, Oklahoma.

LEASE AND DRILLING BLOCKS

DO YOU HAVE A LEASE TO SELL? For as little as $5 per week you can tell your proposition to over 45,000 oil men through the Journal's classified advertising pages. You'll be surprised how many are interested.

ARIZONA—Big "Helium" lease play. Leases Available near Majors $1.00 acre. Terms—Free Maps. Edward Colson, 1716 W. Devonshire, Phoenix, Arizona.

ARIZONA HELIUM, state land, 5 year leases only 25 cents an acre annual rent. In Apache County where Kerr-McGee plant is now building. Free Information. John L. Donahue, 430 16th Street, Denver 2, Colorado. rado.

OIL, GAS, MINERAL Lease for sale. Am fee owner 2,115.63 acres in Carter-Humble block own part Sections 25-30-36-31-1-6 Hempstead County, Arkansas. Within trend of fabulous Jurassic East Texas embayment. Rigid geological investigation solicited. L. W. Littlejohn, Box 82, Beeville, Texas.

DRILLING REPORT: Two wells going to Bartlesville Sand offsetting production. Mail card or letter for full information. MRCO Production Co., Box 59, Cherryvale, Kansas. Phones 740 or 241.

COMPANY reorganizing drilling program. Offers block of 4 leases, 150 A, 410 A, 480 A, 320 A, in 13, 23, 24, 33S, R 13E, Montgomery County, Kansas. Titles examined and O.K. One or all at $5.00 per acre. Western Plains Oil & Gas Co., 1035 Petroleum Club Bldg., Denver, Colo.

FOR SALE—212 A. in fee, first sand lease, located in Plum Tp. Venango County, Pa. 10 wells. 2 core wells show 8,000 Bbls. per A. lease under separate contract for deep drilling. Getting old, must sell. Write Jos. C. Hummer, Star Rt., Titusville, Pa., Phone 5-2284.

FOR SALE: 158 acre proven lease. 9 oil wells producing, 12 proven locations, 81 barrels daily production. Depth 500 feet. Price, $300,000 cash. Subject to prior sale. D. C. Holman, 605 S.E. Riverside Drive, Evansville 13, Indiana, HA 2-7985.

OIL AND GAS PROPERTIES

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Located—near Burkburnett, Texas

Socony Mobil Oil Company, Inc. considering sale of above properties consisting of: 3456 unitized acres, 38 producing oil wells, 2 WSW, 48 WIW, 179 wells NIO. Basic equipment: 11 tank batteries, 21 electrified beam pumping units, 23 Reda pumps, Injection station, electrical and water distribution systems. Sale by bid on November 1, 1961, Not an offer to sell. Reserve right to reject any or all bids.

Complete Information Available on Request

SOCONY MOBIL OIL COMPANY, INC.

P. O. Box 239 **Phone 723-1436**
Wichita Falls, Texas

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WANTED TO BUY—Up to $1,500,000 available for purchase of oil and gas producing leases. Must be good production with a good payout. Not interested in speculative or marginal properties. Box M-574, The Oil and Gas Journal, Tulsa, Oklahoma.

WE WANT to buy substantial oil and gas production and reserves on an actual four year payout basis for cash. Please send full report. Box M-584, The Oil and Gas Journal, Tulsa, Oklahoma.

EQUIPMENT WANTED

WANTED: 12 volt acoustic well sounder or echometer, must be in workable condition. Would consider good 6 volt unit. Homestake Production Company, 2300 Philtower Building, Tulsa, Oklahoma.

WANTED, USED, simultaneous Gamma Ray—Neutron Logging Equipment. Preferably W.S.I., including Dual Pen Brown Recorder. Must be in A-1 condition. Box M-589, The Oil and Gas Journal, Tulsa, Oklahoma.

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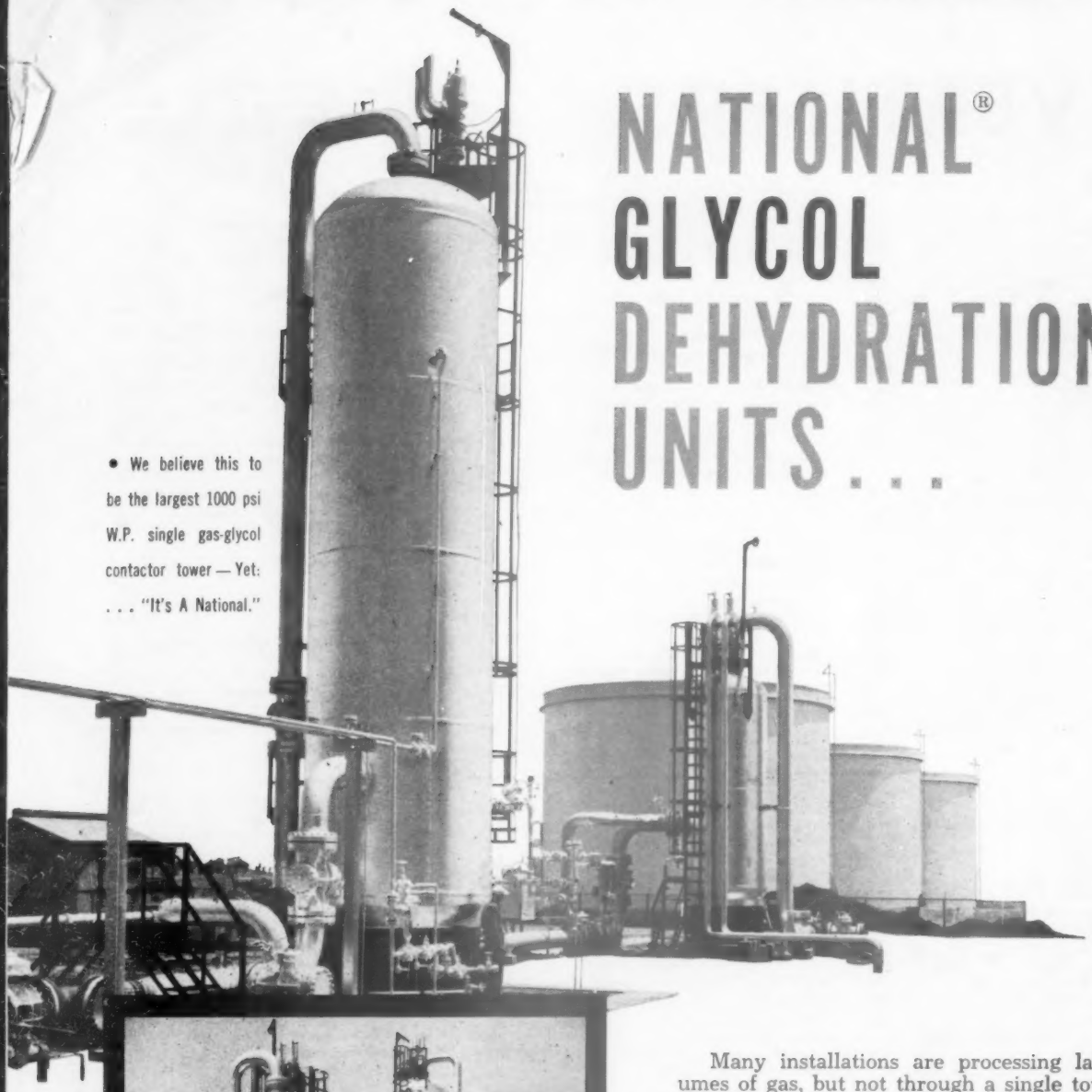
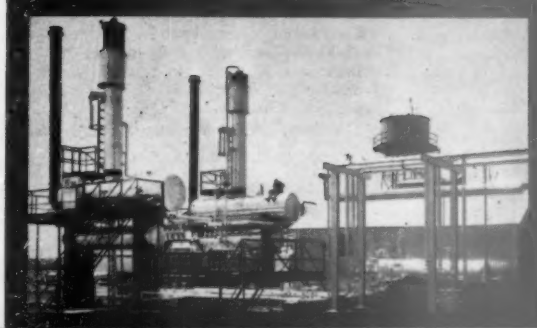


The safety after-scrubber is set to catch glycol which might carry over to the main gas stream . . . ASME Code stamped, 72" ID x 25" high, 1000 psi W.P.

Two glycol reboilers with surge tanks . . . external glycol to glycol heat exchange between. Lower right, glycol distillate skimmer.



Many installations are processing larger volumes of gas, but not through a single tower. This glycol dehydration system was recently added to a gas repressuring plant in Western Oklahoma for drying gas to sales contract specifications.

The ASME Code Stamped contactor tower is 108" ID x 41" high x 3-3/8" thick shell. It weighs 190,000 lbs. and is designed to process 170 MM SCF/D at 1000 psi W.P. It was moved from National's Tulsa plant by special heavy duty railroad car, unloaded, trucked to site and installed by National.

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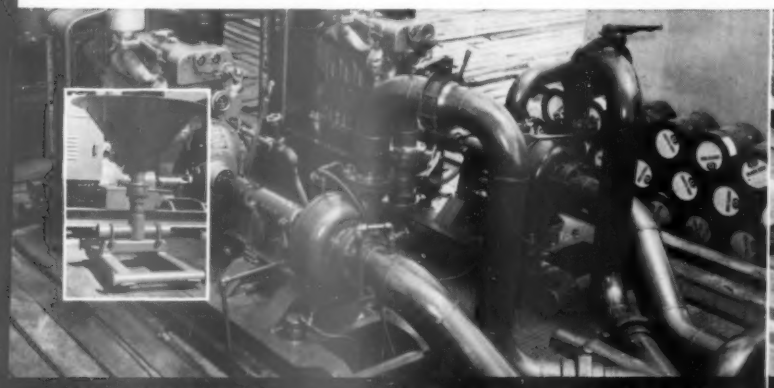
DRAWER 1710

TULSA, OKLAHOMA

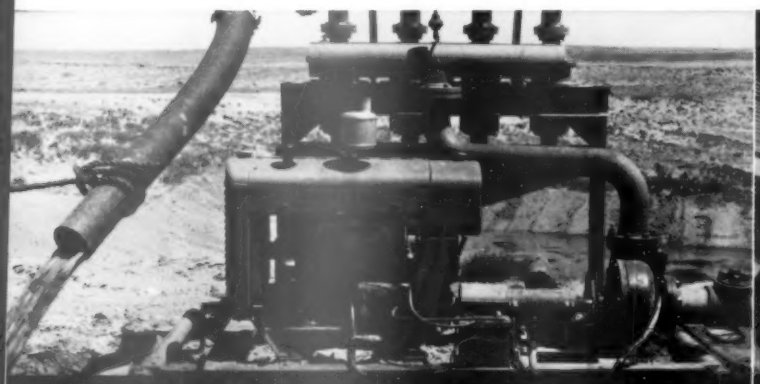
Mission centrifugal pumps for oilwell drilling rig service



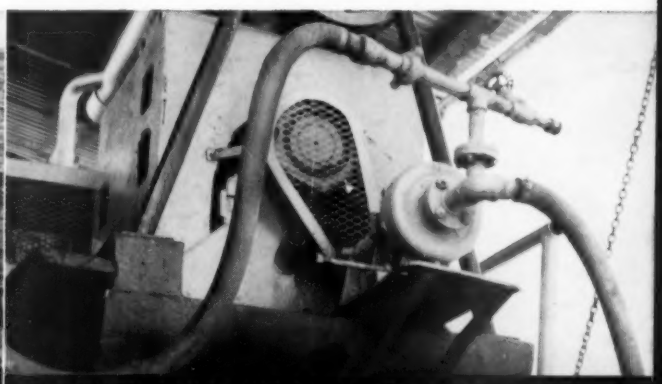
MUD PROCESSING — Large volume capacity permits fast, uniform rolling for mixing and treating. Permits rapid addition of lost circulation material when using the special Mission Mud Mixing Hopper.

MUD PUMP SUPER-CHARGING — Keeps mud pump at peak efficiency. Prevents mud pump from knocking. Increases mud pump volume when mud is air or gas cut.

originally designed for the most rugged rig applications afford



DEGASING AND DESANDING — Mud volume and mud pressure effectively operates degaser and desander equipment.



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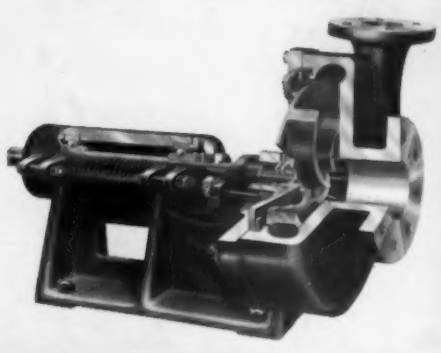

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OVER THIRTY YEARS OF DRILLING RESEARCH

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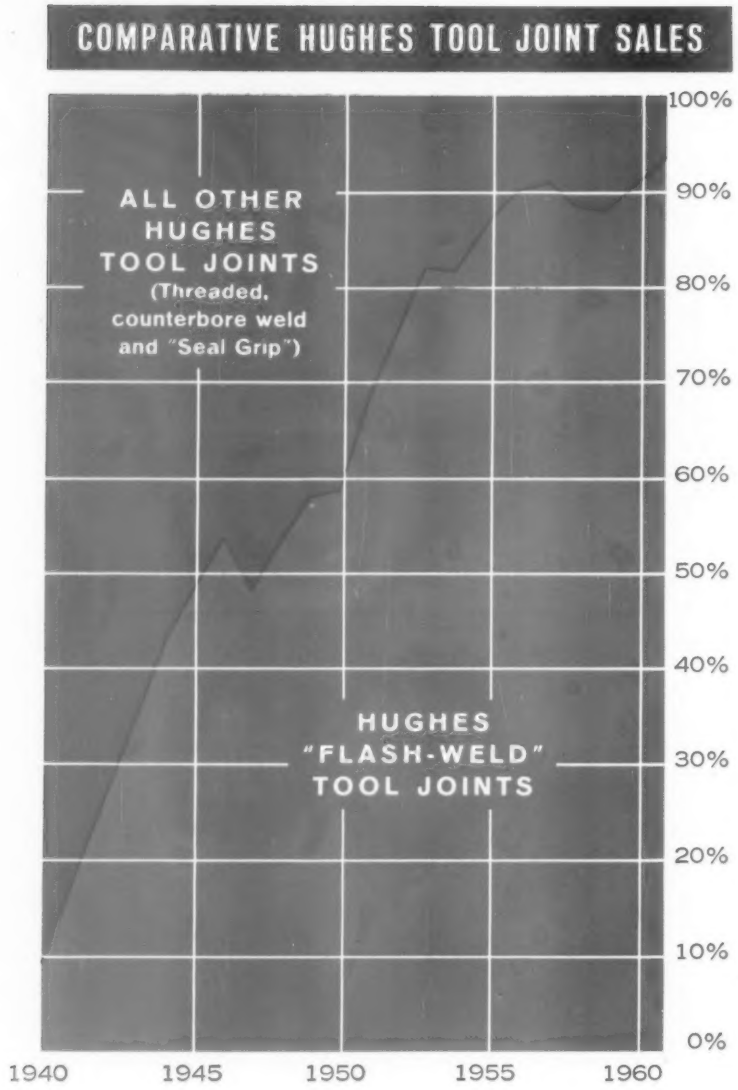

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